



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station - 3rd Comment

1 message

Jeeva Abbate <jeeva@yogaville.org>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 11:58 AM

Virginia Department of Environmental Quality
Piedmont Regional Office
Buckingham Compressor Station
[4949-A Cox Rd](#)
[Glen Allen, VA 23060](#)

Joseph Jeeva Abbate
[12 Ramaa Lane,](#)
Buckingham, VA 23921
Phone: 434-969-3121
Date: August 28, 2018

Dear DEQ,

I am a concerned resident in the Buckingham community, living and working in the area around the proposed location of the ACP Buckingham Compressor Station. I would like to make note of a key concern...that the VA DEQ and the Air Board act on their responsibilities as defined in the Code of Virginia in reviewing the Air Permit for the Buckingham Compressor Station. The Code is clear on these points of consideration:

"The Air Board, in approving permits, "shall consider facts and circumstances relevant to the reasonableness of the activity involved," including: [from Code of Virginia § 10.1-1307.E.]

1. The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused;
2. The social and economic value of the activity involved;
3. The suitability of the activity to the area in which it is located; and
4. The scientific and economic practicality of reducing or eliminating the discharge resulting from such activity."

Keeping those points in mind, the proven fact that Dominion Energy application used incorrect data which allowed them to disregard the true population density and composition of the community exposed to risks of the Compressor Station should invalidate the application:

1. The population density is greater than submitted. On the ground surveys by Dr. Lakshmi Fjord reveal that that actual population density is 600% higher population than Dominion's 29.6 person per square mile density. This falsehood allows

Dominion to us 75% thinner pipes, which benefits Dominion, but dramatically increases the threat to the community.

2. Dominion's own maps show a dense cluster 99 households on all sides of the proposed compressor station.
3. The community is only 17% white and has been subjected to past social injustices, being founded by Freedmen after Emancipation. The Governor's Environmental Justice Committee recommends denial of the air permit. An EJ study was never completed in the permit process.
4. The proposed placement of this compressor station in Union Hill is an example of Racial Injustice. And, in N. Carolina, the ACP proposed compressor station site is in a predominantly poor, Native American Community. Communities of color are not the only ones affected by ACP compressor station sites. In West VA, the compressor station is in a rural, poor white community where coal mines and now fracking is occurring.
5. The community is made up of high risk populations – 32% children, 25% elderly.
6. The Federal Energy Regulatory Commission, FERC, stated that if the Union Hill Community was densely populated by minorities, it would make a difference to the Federal Permit application

We ask that the Air Board act to uphold the intent of the FERC permit and to apply the conditions set by Code of Virginia § 10.1-1307.E. by denying the air permit due to falsification of information in the Dominion application that puts the community at unacceptable risk.

Thank you,
Joseph Jeeva Abbate

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Joseph Jeeva Abbate
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Air Division 1, rr <airdivision1@deq.virginia.gov>

Comments Related to the Compressor Station in Buckingham, Va

1 message

Barb Adams <barb5100@comcast.net>
Reply-To: Barb Adams <barb5100@comcast.net>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 11:13 PM

Air Division members,

Please accept my comments for the Air permit process for the compressor station submitted by the ACP LLC.

Barbara Adams

5100 Montebello Circle

Richmond, VA 23231

804-484-2773



Letter to Air Pollution Control Board.docx
34K

Letter to Air Pollution Control Board

September 20, 2018

Barbara Adams,
5100 Montebello Circle
Richmond, VA 23231
804-484-2773

To Air Pollution Control Board Members:

Thank you in advance for your patient attendance and diligent review of the citizen comments regarding the air permit for the ACP LLC compressor station proposed to be built in Buckingham County. I am sure you will be receiving comments that address the permitting process directly and specifically. I would like to speak from a different perspective that seems outside the regulatory guidelines, but feel it must be brought into the arena nevertheless.

With this statement, I ask that the APCB and DEQ require a Comprehensive Health Risk Analysis to be done and work with the Department of Health, Department of Emergency Management and others to conduct a Cumulative Health Impact Study for all residents living in proximity to the compressor station site before this permit is approved.

Background

It may seem obvious, but the basis of this air permit process for the Buckingham County compressor station is the Federal Clean Air Act. The Clean Air Act is the law that defines EPA's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer, and Virginia's air quality guidelines arose from it. The origins of this act and the serious intention and purpose for its creation, are to insure air quality so as to protect the health and well-being of all Americans from the many dangerous, harmful consequences of air pollution in its many forms and from all sources. I believe it is therefore the obligation of any official body, legislator, policy-maker, including the DEQ and the State Air Pollution Control Board to follow the CAA's *intention* and its *precepts*, and insure that clean air will be achieved and maintained.

My Point

“Future studies are needed to quantify and understand the cumulative risk associated with the combined health impacts of air pollution, chronic noise exposures, and stress among [these] impacted communities,” stated Dr. Amir Sapkota, Associate Professor in the UMD SPH’s Maryland Institute for Applied Environmental Health.

Dr Sapkota speaks my mind. After attending meetings at all levels of this permitting process, it leaves me with the very serious concern that regardless of how “rigorous” the guidelines have been set for this application, regardless of the honing over three years to create strict guidelines within regulatory numbers, the very obvious reality is that the quality of life for all Union Hill/ Buckingham residents near the compressor station will absolutely decrease significantly and the potential for negative health impacts will absolutely increase.

Without an overseeing body, the silo and “specialization” nature of the regulatory process does not allow assessment of the impacts on human physical and mental health. Mental and emotional stress is already evident in residents who are living with anticipation of possible harm and prompted by a regulatory process that devalues input by them, giving weight to “legal and scientific” data and evidence. Even when such evidence has been provided, it has been dismissed and overlooked by deciding bodies. The reality is that affected Buckingham citizens are actually facing risks from a number of sources and it is no agency’s responsibility to understand this and take it into account when decisions are being made. This greater understanding needs to be made evident to all those who are making decisions that affect the well-being and lives of those most impacted.

I would have like to have provided comments more stressors, below I have tried to briefly outline the multiple streams of distress. They are:

- Toxicity and Air Pollution
- Noise Pollution
- Water Contamination
- Land and home devaluation
- Environmental Justice and Racism
- Explosions and Disasters
- Climate Change

It is not lost on affected landowners, and all concerned citizens that are aligned to support them, that the process is skewed towards the ACP LLC and that their land, homes, health and lives are seen as “expendable” when compared with the power of the company and the influence that it has over the permitting process at every level. They are being sacrificed by Governor Northam, Secretary Strickler, their local elected officials and the DEQ. There remains hope that the Air Pollution Control Board, as a citizen board, can operate from a broader, more humane perspective and see itself as separate from the DEQ, making decisions with a citizen’s perspective.

Toxic Air Pollution

With little heavy industry, rural Buckingham County generally has good ambient air quality, with ozone and PPM readings in the mid to low 20’s. The compressor station would significantly change both the amount of pollution and the nature of the pollutants, especially for the residents living closest to the facility. Toxic air pollution would be the greatest concern.

NAAQS as Relates to Human Health

- A primary concern is the poor fit of a *tons per year* measurement to the assessment of risk to the public’s health near a compressor station. Furthermore, the National Ambient Air Quality Standards (NAAQS) used as a benchmark for air quality were not created to assess the air quality and safety in a small geographic area with fluctuating emissions. NAAQS effectively address regional air quality concerns. **But these standards do not adequately assess risk to human health for residents living in close proximity to polluting sources such as compressor stations, where emissions can be highly variable.**
- NAAQS reflects what, over a region, over time, is deemed safe population-wide. This is very different than what is safe within for instance 1200 feet of this compressor station. Averaging over a year can wash out important higher spikes in emissions (exposures) that may occur at various points throughout the year. These high spikes can put residents at risk for illnesses caused by toxic gases.
- Current protocols used for assessing compliance with ambient air standards do not adequately determine the intensity, frequency or durations of the actual human exposures to the mixtures of toxic materials released regularly at facilities like compressor stations.

- The typically used periodic 24-hour average measures can underestimate actual exposures by an order of magnitude. Reference standards are set in a form that inaccurately determines health risk because they do not fully consider the potential synergistic combinations of toxic air emissions. **Thus estimates of yearly totals of contaminants released by a compressor station do not allow for an assessment of the physiological impact of those emissions on individuals.**

Toxicity and the Human Body

- Toxicity of a chemical to the human body is determined by the concentration of the agent at the receptor where it acts. This concentration is determined by the intensity and duration of the exposure. Once a receptor is activated, a health event might be produced immediately or in as little as one to two hours. In some instances, where there is a high concentration of an agent, a single significant exposure can cause injury or illness. This is the case in the instance of an air contaminant induced asthma event. On the other hand, after an initial exposure, future exposures might compound the impact of the first one, in time, producing a health effect. Repeated exposures will increase, for instance, the risk for ischemic heart disease.
- Because episodic high exposures are not typically documented and analyzed by researchers and public agencies, natural gas compressor stations emissions are rarely correlated with health effects in nearby residents. However, examination of published air emission measurements shows the very real potential for harm from such emissions. **Reports of acute onset of respiratory, neurologic, dermal, vascular, abdominal, and gastrointestinal from sequential exposure near natural gas facilities contrast with research that suggests there is limited risk posed by compressor station facilities.**

Emission Composition

- Spectral analysis has shown that, in addition to methane, SO₂, NO₂, and particulate matter, there are known highly toxic and carcinogenic chemicals used in the fracking and gas stabilization process that will be emitted, especially during blowdowns. The amounts are minimal, but because of their high toxicity, cannot be relegated as “safe” just because they fall within FERC and VA state regulation guidelines. Again, we are looking at cumulative and aggregate exposure and potential health impacts to humans and other living creatures. (see attached grid)

They include: 1,3-Butadiene, Acetaldehyde, Acrolein, Benzene, Ethylbenzene, Formaldehyde, Naphthalene, Propylene oxide, Toluene, Xylenes.

- Formaldehyde levels are discussed and addressed in the permit application, but there has been no discussion of the possible effects of the interaction of all the chemical gases present or the effects of rainfall and humidity on potential retention on land and other surfaces.
- Compressor stations also present a possible source of radioactive exposures. The gas in the pipelines lines typically carries some radon, and as the radon decays, it leaves polonium and lead to build up inside the pipes. When these radioactive by-products are present, workers and nearby residents could be exposed during blowdowns. Gas customers at the end of pipelines may also be exposed. Workers could receive radiation exposure when handling contaminated pipes during routine cleaning or maintenance. Greater attention needs to be paid to potential radon levels and exposure risks.

Toxicity and Health

- From studies of those leaving near existing stations, (more are needed), there is growing documentation of health consequences, including: frequent nausea, sinus problems, fatigue, dizziness, depression, brain disorders, difficulty concentrating, throat irritation, bronchitis, dermatitis, chronic eye irritation, ringing in ears, decreased motor skills, severe headaches, joint pain, eyes burning, persistent cough, shortness of breath, sores/ulcers in mouth, falling, staggering, frequent nose bleeds, nervous system impacts, allergies, abnormal EEG, amnesia, nasal irritation, weakness, muscle aches, urinary infections, frequent irritation, sleep disturbances, forgetfulness, bruising, thyroid problems, irregular/rapid heartbeat, strokes, severe anxiety, excessive sweating, lump in breast, pre-cancerous lesions.
- The difficulty in directly correlating health complaints with exposure to emissions may be partly due to the failure to collect information about intermittent peak exposures. Toxic air emissions are often reported as averages over a year, which fails to account for shorter, more intense incidents of exposure that can cause more damage than a consistent, lower average exposure.
- It is important to know, with more specificity, what chemicals will be emitted by a compressor facility so that a targeted assessment can be made about its potential health impacts.

Noise pollution

Public Health Danger

- Disturbing levels of sound become a medical issue when the noise interferes with normal activities and the quality of life. Being unable to sleep or to have a normal conversation for extended periods or at recurring intervals creates stress. Chronic noise pollution can cause ill health effects, including high blood pressure, ulcers, colitis and asthma and lead to acute and chronic hypertension, endocrine disruption, heart disease, headaches, nosebleeds, disruption of normal concentration, focus and productivity.
- The World Health Organization recommends nighttime noise levels below 40 decibels to reduce the risk of sleep disturbance, insomnia, and use of drugs for sleeping. Outdoor noise pollution above 55 decibels and indoor noise pollution above 45 decibels may interfere with activities and lead to annoyance, according to the U.S. Environmental Protection Agency. It has been found in situations of existing compressor stations, that compressor stations typically had combined outdoor average sound levels greater than 55 decibels over a 24 hour period..

Guidelines and Enforcement

- Compressors operate 24 hours a day, 365 days a year. The pressure pulses from compressors can be quite severe, and equivalent sound pressure levels can exceed 105dB. With the compressor station permit approved by the Buckingham County Board of Supervisors, the compressor would be allowed to generate 55 decibels at the property line or any adjacent building (Special Use Permit Item #6). It states that all reasonable efforts would be made to *limit* noise but does not *require* this limitation. Federal laws and regulations attempt to reduce this risk to public health, but state and local governments have a responsibility to support residents and protect against noise pollution.
- Noise from compressor stations along interstate pipelines is regulated by the Federal Energy Regulatory Commission. It is the FERC's requirement that noise levels not exceed 55dB at any time, day or night.
- If responsibility for monitoring and enforcing infractions of the FERC guidelines and the county's noise ordinance defaults to Buckingham County police, it would be unlikely that they would have the staff and adequate equipment to effectively fulfill this role. Residents will need to purchase equipment to monitor themselves and assume the burden of proof of infractions to FERC, local officials and the ACP LLC. Too often, noise pollution from industrial sources is not controlled. It's a reasonable conclusion, and is well documented in areas of existing compressor stations of this size, that those residing close to the station will experience

significant noise pollution that very likely will not be monitored and controls enforced.

Water Contamination

While not the greatest potential source of pollution in Buckingham, the potential is still significant for contamination of water by both the installation of the pipelines serving the compressor station and the potential, leaking and explosion of them. Most residents in rural Buckingham rely on well water for consumption and home use.

- Pipeline construction creates significant amounts of sedimentation and erosion, clogging streams and waterways; debris, diesel fuel are also by-products of the installation process, with the real potential to contaminate waterways and aquifers, making its way to underground drinking water wells.
- Once installed, leaking pipes – especially 42” wide pipes, carrying gas under extremely high pressure - are highly likely to leak the above toxic chemical mixtures into land and ground water. Loss of water due to aquifer and well water contamination means no water in the home and cannot be mitigated.
- In other states when well water has been forever compromised, pipeline companies often will provide water (installing buffalo tanks) for a period of time, without admitting responsibility. Then, within a year to 18 months, they have been known to discontinue this cost and delivery, citing that they were providing a “community service” not admitting responsibility. The residents then must decide how they will pay for and live with the need to purchase water for as long as they lie on the property.

Land and Home Devaluation

It is well documented that properties along pipelines and around compressor stations lose property value almost immediately the project is announced. Once the project gets full approval, the property loses value again, and then more once the project is completed.

- All of the potential hazards associated with fracked natural gas pipelines and compressor stations result in, rightly, “buyer beware” thinking and fuels lower property values. The possibility to sell the house and move to escape the dangers of the compressor station becomes near impossible, especially for those on limited and fixed incomes.

- In addition, insurance companies and banks see such properties as lower in value and high-risk, and often premiums go up, assessments go down, and remortgaging and reverse mortgaging are not options.

Environmental Justice and Racism

FERC's parent organization is the Department of Energy, which has a detailed strategy for incorporating principals of environmental justice into its actions and departmental operations. Part of this strategy is to "identify and address programs, policies, and activities that may have disproportionately high and adverse human health or environmental effects on minority, low-income, and tribal populations." It is striking that FERC would be so isolated from this goal of its parent agency, and not held accountable to Section VI of the Civil Rights Act.

- On the Atlantic Coast Pipeline, there is a higher than average percent population of African Americans living along the proposed route. The statewide African American population is 21.3%, but in 7 of 8 counties along the proposed route the black population ranges from 24.3 – 58.4%.
- Income vulnerability is also an issue in populations that would be impacted by the pipeline--7 of the 8 counties have median household incomes below the statewide median of \$46,693. Seven of 8 counties along the proposed route have poverty levels higher than the state. Those are county-wide figures, and the pipeline will only affect a portion of each county, but still this gives an idea of the economic environments of the pipeline-impacted communities.
- The Governor's Advisory Council on Environmental Justice chose Union Hill and Buckingham County as its second EJ issue to address in the state, the first related to a community impacted by a specific industry project. The Council overwhelmingly approved their detailed Pipeline Sub-Committee study, which outlines and documents the many specific issues of environmental injustice and racism that the ACP LLC, the DEQ, the permitting bodies and local and state officials and agencies ignored. Community members have been abandoned, the complaints and concerns of the residents and community unaddressed – still - and they have been excluded all along the process. Also, not making pertinent data readily available in hard copy form is a form of environmental injustice, assuming all people have internet, or functional internet, in the home and have easy access to computers to be able to educate themselves, do research, file on-line, etc.

- ACP LLC mistakenly reported the demographics of the community in its FERC application, also the racial and income data of the community and the numbers of people that would be impacted.
- Noise and air pollution from a natural gas compressor station, as described in the air permit, would place a disproportionate impact on minority communities in Buckingham County.

Explosions and Disasters

It's a fact - gas pipelines explode. Residents in Buckingham, and all impacted along the ACP are justified in their concern about this very real possibility. The fact that ACP LLC has not – and has not been made to – provide emergency and disaster plans for the area around the compressor station is negligent at the very least. It is no wonder that residents feel the company is untrustworthy and is not reassured by their lack of transparency about the possibility of explosions. They must be required to provide such a plan before the project can move forward.

<https://www.nts.gov/investigations/AccidentReports/Pages/pipeline.aspx>

- A gas pipeline in Appomattox County, Virginia, exploded in 2008, destroying two homes, melting the siding on over 100 others as far as a mile away. Clearly, the radiational heat from these explosions is tremendous.
- On January 24, 2011, Dominion gas pressure regulators in Fairport, Ohio – including the backup regulator - failed due to icing, causing a gas surge that set off numerous explosions and house fires, completely destroying seven homes. It was very fortunate no lives were lost, but there was extensive property damage and disruption. At a public meeting between Dominion East Ohio officials and customers from the affected area, one customer noted that he was instructed to evacuate his house, so naturally he locked it when he left. However the shutoff valve to his home gas line is inside his house, as was the case with other evacuees' homes. Dominion has made no plans to move the location of those shutoff valves outside, in order to be more accessible to service personnel. Dominion East Ohio also said they had no idea why the regulators froze, as they had not experienced this problem in much colder temperatures.
- In 2012, a 20" natural gas pipeline exploded in Sissonville, WV along Interstate 77, melting 800' of the interstate highway, destroying three homes and damaging countless others.

- On December 5, 2013, also in Ohio, one of Dominion's 8-inch steel pipes ruptured, causing an explosion that created a 10 foot-wide crater, with gas shooting up into the air. In trying to figure out what happened, Dominion officials were unsure if this incident was even considered "reportable".

Climate Change

According to the EPA, the oil and gas industry is the largest source of U.S. methane emissions, followed by agriculture. A new study published today in the journal *Science* finds climate-damaging methane emissions from the nation's oil and gas industry are nearly 60 percent higher than Environmental Protection Agency estimates — effectively negating the near-term benefits of burning more natural gas.

- As the U.S. shale boom has grown, natural gas has been hailed as the cleanest-burning fossil fuel. It is displacing coal as the fuel of choice for electric power generation, and it's often pitched as a bridge to a cleaner energy future. But natural gas is mostly methane, and methane leaks out of wells, pipelines, compressor stations, and storage tanks.
- While carbon dioxide stays in the atmosphere for centuries, methane lasts only a few decades — but it packs a much bigger initial climate punch. Over a 20-year time frame, methane is 86 times more potent as a heat-trapping greenhouse gas than CO₂. Society is missing out on most of the near-term benefits of burning more natural gas.
- Dominion's Atlantic Coast Pipeline additional methane contributions at multiple points in extraction and transportation activities, will accelerate global climate change in the US and globally. The commitment by Governor Northam and the state of Virginia to the Clean Energy Plan cannot support this additional fracked gas infrastructure.



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Leroy Adkins <Leroy.Adkins.117751521@p2a.co>

Fri, Sep 21, 2018 at 4:32 PM

Reply-To: leroy.adkins@dominionenergy.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Leroy Adkins
[7840 Courthouse Rd](#)
[Providence Forge, VA 23140](#)

The ACP: Safe for Buckingham County

1 message

Eugene Alley <Eugene.Alley.107622516@p2a.co>

Fri, Sep 21, 2018 at 5:31 PM

Reply-To: festavus@verizon.net

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Eugene Alley
[1704 River Shores Ct](#)
[Virginia Beach, VA 23454](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Andres Alvarez <Andres.Alvarez.126355675@p2a.co>

Fri, Sep 21, 2018 at 10:18 PM

Reply-To: alvarezdelaf@vcu.edu

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a "minor" source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Andres Alvarez
[13608 Winning Colors Ln](#)
[Midlothian, VA 23112](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Comments re: Buckingham Compressor Station 21599 - EIP & App Voices1 message

Peter Anderson <peter@appvoices.org>

Fri, Sep 21, 2018 at 5:25 PM

To: airdivision1@deq.virginia.gov

Cc: Benjamin Kunstman <bkunstman@environmentalintegrity.org>, michael.dowd@deq.virginia.gov

Good afternoon,

Environmental Integrity Project and Appalachian Voices respectfully submit the attached comments regarding a draft permit for the Buckingham Compressor Station.

Thank you.

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Peter Anderson
Virginia Program Manager
Appalachian Voices
812 E. High Street
Charlottesville, VA 22902
(434) 293-6373 office
(434) 249-6446 cell

**EIP - App Voices Comments - Buckingham Comp Station 21599.pdf**

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ENVIRONMENTAL
INTEGRITY PROJECT



Appalachian
Voices

September 21, 2018

Air Pollution Control Board
c/o Office of Regulatory Affairs
Department of Environmental Quality
P.O. Box 1105
Richmond, Virginia 23218

David Paylor, Director
Department of Environmental Quality
1111 East Main Street, Suite 1400
Richmond, VA 23219

Re: Comments on Draft Stationary Source Permit to Construct and Operate Compressor Station 2 for Atlantic Coast Pipeline, LLC # 21599

Dear Director Paylor, Chairman Langford, and Members of the Air Pollution Control Board:

Appalachian Voices is a 501(c)(3) nonprofit organization advocating for healthy communities in Central and Southern Appalachia, with a focus on an equitable and just transition to a clean energy economy. Due to our organizational emphasis on justice and equity in the region, we have a heightened interest in the draft permit for a compressor station project sited in Buckingham County, Virginia. The compressor station proposed by Atlantic Coast Pipeline, LLC (“ACP”) would be sited within an identified environmental justice community whose demographic is 85% African American, undoubtedly creating a disproportionate pollution impact.

The Environmental Integrity Project is a nonprofit, nonpartisan organization that empowers communities and protects public health and the environment by investigating polluters, holding them accountable under the law, and strengthening public policy.

We respectfully offer the following comments to the Department of Environmental Quality (herein “the Department”) regarding the Draft Stationary Source Permit to Construct and Operate Atlantic Coast Pipeline Compressor Station 2 located at 5297 S. James River Hwy, Wingina, in Buckingham County, Virginia.

The Department should replace the proposed stack tests for regulated pollutants with a requirement for continuous emission monitoring systems (CEMS)

The monitoring requirements contained in the Draft Permit are not adequate to ensure compliance with the emissions limits set out therein because they do not require continuous or even frequent measurement of outgoing pollutant concentrations from the compressor turbines. For example, the performance tests set out in Condition 29 of the Draft Permit for emissions of nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compounds (VOC), and particulate matter (PM10 and PM2.5) are only required to be performed upon initial operation and then repeated once every two years thereafter.¹ The Draft Permit states that emissions will be derived from the estimated overall emission contribution from operating limits, rather than direct measurement of pollutant emissions.

These criteria pollutants have a high potential to adversely impact human health in concentrations above federal standards. However, if emissions controls and other equipment cease to perform at the required level, a problem might go undetected for months or years. Continuous emission monitoring systems (CEMS) for regulated pollutants should replace the stack tests set out in Conditions 29, 30, 31, 32, 49, and 50 in order to ensure compliance with the permit's emissions limitations.²

In particular, the Department's potential to emit (PTE) calculations are based on the assumption of near-constant achievement of a 3.75 ppm NOx rate at each compressor turbine and near-constant operation of selective catalytic reduction (SCR). There are several factors that could interfere with achieving this rate in practice. Therefore, it is critical that compliance with the enforceable NOx limit of 3.75 ppm in the Draft Permit is assessed using CEMS for NOx.

The Department must revise the draft permit to prohibit ACP from operating the compressor turbines below 50% capacity except during the limited start-up/shutdown events included in PTE calculations.

As acknowledged in the Department's own engineering analysis, the SoLoNOx control efficiency for the compressor turbines is diminished at low loads (below 50% capacity),³ which results in significant increases in NOx, VOC, and CO emissions as seen in the attached product information letter from the turbine manufacturer.⁴ At operating loads below 50% capacity, CO emissions from the turbines increase to 8,000 ppm, with higher NOx and VOC emissions as well. However, the Department has not included emissions from any low-load operations in its calculation of the compressor station's potential to emit (PTE), other than the limited estimates of start-up and shutdown emissions. With the exception of these start-up and shutdown events,

¹ Commonwealth of Virginia, Department of Environmental Quality, Draft Stationary Source Permit to Construct and Operate 15 (2018), available at https://www.deq.virginia.gov/Portals/0/DEQ/Air/BuckinghamCompressorStation/21599_BCS_DRAFT_Permit.pdf ("Draft Permit").

² See Draft Permit at 15, 22.

³ See Commonwealth of Virginia, Department of Environmental Quality, Intra-Agency Memorandum 4, 10 (2018), available at https://www.deq.virginia.gov/Portals/0/DEQ/Air/BuckinghamCompressorStation/21599_BCS_DRAFT_Analysis.pdf ("Engineering Analysis").

⁴ See Leslie Witherspoon, Solar Turbines, PIL 167 Revision 4, SoLoNOx Products: Emissions in Non-SoLoNOx Modes 2-4 (June 6, 2012) ("PIL 167").

the Department may not exclude hours of low-load operation from PTE calculations unless it prohibits ACP from operating the turbines at low loads in the Permit.

The Engineering Analysis specifically states that the Buckingham Compressor Station “cannot operate below 50% load unless during start-up or shutdown.”⁵ However, the Draft Permit fails to specifically prohibit operation below 50% capacity. The Department may not treat operating capacity above 50% as a limitation on the source’s PTE unless that limitation is set forth in the Permit as an enforceable condition. The Department must revise the Draft Permit to prohibit ACP from operating the compressor station below 50% capacity, or account for low-load emissions increases in PTE calculations.

Emissions Rate Limitations Should Apply During Start-Up and Shutdown Procedures

While the Draft Permit properly limits the total annual hours of start-up and shutdown events for the compressor turbines and the number of hours in which they may take place, it fails to set emission rates on pollutants other than VOCs during these events. The other regulated pollutants limited during operation (CO, NO_x, PM, PM₁₀, PM_{2.5}, SO₂) should be limited during start-up and shutdown as well. As seen in the turbine manufacturer’s product information letter,⁶ additional NO_x, CO, and VOC emissions can occur during start-up and shutdown, and should be similarly limited within the permit conditions.

The Department Must Set Emissions Limits for NO_x, VOC, and CO from the Turbines During Temperatures Below 0 degrees Fahrenheit.

Emissions of NO_x, VOC, and CO from the turbines can increase significantly at temperatures below 0 degrees Fahrenheit.⁷ The Department has included an estimated 5 hours of increased emissions due to such conditions within the Engineering Analysis. While the Department and ACP cannot predict or control the number of hours with temperatures below 0 degrees Fahrenheit that actually occur each year, the Department must still set emissions limits that apply during these periods.

Emissions limits should not be entirely exempted at abnormally low temperatures, and they must be made enforceable conditions of the Permit. Even if the standard limits cannot be met at temperatures between 0 and -20 degrees Fahrenheit, secondary limitations must be set and enforced. The Department’s Engineering Analysis states that the proposed turbines will use the Cold Ambient Temperature Logic, which guarantees emission rates at temperatures between -20 and 0 degrees Fahrenheit for the turbines.⁸ The Department should set enforceable limits on emissions below 0 degrees Fahrenheit as these are guaranteed, predictable emissions that should be limited to no higher than the manufacturer specified emission rates with control of NO_x, CO, and VOC at 58%, 92% and 50%, respectively.⁹

⁵ Engineering Analysis at 4.

⁶ Leslie Witherspoon, Solar Turbines, PIL 170 Revision 5, Emissions Estimates at Start-Up, Shutdown, and Commissioning for SoLoNO_x Combustion Products (June 13, 2012) (“PIL 170”).

⁷ See PIL 167 at 1-3.

⁸ Engineering Analysis at 10.

⁹ See PIL 167 at 2.

The Department Should Condition the Permit Upon Pending Greenhouse Gas Regulations

Virginia is poised to begin regulating carbon dioxide emissions from electric power plants through the regulation being developed under Executive Directive 11. This draft regulation would set limits on large stationary sources' CO₂ emissions, but it ignores the complete lifecycle greenhouse gas emissions from production, transportation, and storage of fossil fuels that are ultimately combusted for electricity generation. Ignoring the greenhouse gas emissions from fossil fuel transportation and storage infrastructure is unnecessarily limiting and ultimately self-defeating.

According to analysis by Oil Change International, lifecycle greenhouse gas emissions from the Atlantic Coast Pipeline are estimated at nearly 68 million metric tons annually, or the approximate equivalent of 20 new coal-fired power plants.¹⁰ Methane leakage and emissions from pipeline operation account for more than half of that total. Further, the Federal Energy Regulatory Commission's Environmental Impact Statement for the Atlantic Coast Pipeline states that the Buckingham Compressor Station alone has the potential to emit 323,736 tons of CO₂e annually.¹¹

But Virginia may not ignore fugitive methane emissions from gas infrastructure much longer. Governor Northam announced on September 12, 2018 that his administration intends to develop regulations limiting methane emissions from natural gas infrastructure.¹² Virginia has broad authority under state law to regulate greenhouse gas emissions, and it now appears likely that "due to inaction at the federal level," the Commonwealth will "take action to limit methane pollution within its borders."¹³

To its credit, the Department outlines several sensible process requirements to control both the venting of natural gas and fugitive emissions from leaks in the Draft Permit.¹⁴ These are important first steps. However, because methane emissions from natural gas infrastructure are likely to be regulated in the future, the Department should take additional steps in the Draft Permit to ensure that this compressor station will meet any future standards promulgated, including a numeric emissions limitation. The Department should add a condition to the Draft Permit explicitly reserving the right of the Department and the Air Pollution Control Board to regulate methane emissions from the Buckingham compressor station in conformity with any future regulation published.

If the Department Cannot Demonstrate That Operation of the Buckingham Compressor Station Will Not Have a Disproportionate Adverse Impact on Environmental Justice

¹⁰ Oil Change Int'l, The Atlantic Coast Pipeline: Greenhouse Gas Emission Briefing (Feb. 2017), available at http://priceofoil.org/content/uploads/2017/02/atlantic_coast_pipeline_web_final_v3.pdf.

¹¹ Federal Energy Regulatory Commission, Atlantic Coast Pipeline and Supply Header Project Final Environmental Impact Statement 4-559 (July, 2017).

¹² Press Release, Gov. Ralph Northam, Northam Administration Takes New Steps to Fight Climate Change, Ocean Acidification (Sept. 12, 2018), available at <https://www.governor.virginia.gov/newsroom/all-releases/2018/september/headline-829610-en.html>.

¹³ *Id.*

¹⁴ See Draft Permit at 7-9.

Communities, It Must Reject the Draft Permit in Order to Act Consistently With the Commonwealth Energy Policy

Finally, it is the policy of the Commonwealth to “[e]nsure that development of new, or expansion of existing, energy resources or facilities does not have a disproportionate adverse impact on economically disadvantaged or minority communities.”¹⁵ According to a study conducted by anthropologist Dr. Lakshmi Fjord, the community within a 1.1 mile radius of this proposed compressor station is an environmental justice community where over 85% of households are African-American, 33% are descendants of Freedmen, and the numbers of elderly (70+) and the very young (0-6) are disproportionately higher than other age groups.¹⁶

In taking any discretionary action, such as the decision to approve or reject ACP’s application for a stationary source permit to construct and operate the Buckingham County compressor station, the Department “shall recognize the elements of the Commonwealth Energy Policy and where appropriate, shall act in a manner consistent therewith.”¹⁷ This includes the aforementioned requirement to ensure that new energy resources or facilities do not have a disproportionate adverse impact on economically disadvantaged or minority communities.

If this compressor station receives a permit from the Department and is constructed, its operation will undoubtedly subject an economically disadvantaged and minority community to higher levels of air pollution than experienced by other Virginia citizens, even if ambient air quality standards are still attained statewide. If the Department cannot demonstrate that the Buckingham Compressor Station will not have a disproportionate adverse impact on an environmental justice community, the Department and Board must reject the Draft Permit in order to act in a matter consistent with the Commonwealth Energy Policy.”

While the Commonwealth Energy Policy “shall not be construed to amend, repeal, or override any contrary provision of applicable law,” it is not inconsistent with the state air pollution control laws for the Department and Board to recognize the Commonwealth Energy Policy here (specifically its environmental justice policy under subsection (A)(11)). While the Department and Board may have little or no authority on siting decisions, they have full authority to issue, amend, revoke, terminate, and reissue permits to control the emission of air pollutants in the Commonwealth.¹⁸ In this case, the Department and Board should use their full authority under the state air pollution laws and the Commonwealth Energy Policy to reject the application for Stationary Source Permit to Construct and Operate the Buckingham County Compressor Station.

Alternatively, if there is evidence showing that rejecting the Draft Permit under the Commonwealth Energy Policy subsection (A)(11) is inconsistent with applicable law, the Department and the Board should incorporate into the Draft Permit’s conditions the comments outlined above.

¹⁵ VA Code § 67-102 (A)(11).

¹⁶ Lakshmi Fjord, Report to the Permanent Peoples’ Tribunal Session on Human Rights, Fracking and Climate Change 63 (2018), available at <https://www.tribunalonfracking.org/wp-content/uploads/2018/04/Cvllle-Peoples-Trib-Summary-Report.pdf>.

¹⁷ VA Code § 67-102 (C).

¹⁸ VA Code § 10.1-1322.

Thank you for the opportunity to comment on this important matter.

A handwritten signature in black ink, reading "Tom Cormons". The signature is fluid and cursive, with a long horizontal stroke at the end.

Tom Cormons, Executive Director
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A handwritten signature in black ink, reading "Eric Schaeffer". The signature is cursive and somewhat stylized, with a large "E" and a long "S".

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SoLoNO_x Products: Emissions in Non-SoLoNO_x Modes

Leslie Witherspoon

Solar Turbines Incorporated

PURPOSE

Solar's gas turbine dry low NO_x emissions combustion systems, known as *SoLoNO_x*[™], have been developed to provide the lowest emissions possible during normal operating conditions. In order to optimize the performance of the turbine, the combustion and fuel systems are designed to reduce NO_x, CO and unburned hydrocarbons (UHC) without penalizing stability or transient capabilities. At very low load and cold temperature extremes, the *SoLoNO_x* system must be controlled differently in order to assure stable operation. The required adjustments to the turbine controls at these conditions cause emissions to increase.

The purpose of this Product Information Letter is to provide emissions estimates, and in some cases warrantable emissions for NO_x, CO and UHC, at off-design conditions.

Historically, regulatory agencies have not required a specific emissions level to be met at low load or cold ambient operating conditions, but have asked what emissions levels are expected. The expected values are necessary to appropriately estimate emissions for annual emissions inventory purposes and for New Source Review applicability determinations and permitting.

COLD AMBIENT EMISSIONS ESTIMATES

Solar's standard temperature range warranty for gas turbines with *SoLoNO_x* combustion is $\geq 0^{\circ}\text{F}$ (-20°C). The *Titan*[™] 250 is an exception, with a lower standard warranty at $\geq -20^{\circ}\text{F}$ (-29°C). At ambient temperatures below 0°F , many of Solar's turbine engine models are controlled to increase pilot fuel to improve flame stability and emissions are higher. Without the increase in pilot fuel at temperatures below 0°F the engines may exhibit combustor rumble, as operation may be near the lean stability limit.

If a cold ambient emissions warranty is requested, a new production turbine configured with the latest combustion hardware is required. For most models this refers to the inclusion of Cold Ambient Fuel Control Logic.

Emissions warranties are not offered for ambient temperatures below -20°F (-29°C). In addition, cold ambient emissions warranties cannot be offered for the *Centaur*[®] 40 turbine.

Table 1 provides expected and warrantable (upon Solar's documented approval) emissions levels for Solar's *SoLoNO_x* combustion turbines. All emissions levels are in ppm at 15% O₂. Refer to Product Information Letter 205 for *Mercury*[™] 50 turbine emissions estimates.

For information on the availability and approvals for cold ambient temperature emissions warranties, please contact Solar's sales representatives.

Table 2 summarizes “expected” emissions levels for ambient temperatures below 0°F (–20°C) for Solar’s *SoLoNOx* turbines that do not have current production hardware or for new production hardware that is not equipped with the cold ambient fuel control logic. The emissions levels are extrapolated from San Diego factory tests and may vary at extreme temperatures and as a result of variations in other parameters, such as fuel composition, fuel quality, etc.

For more conservative NOx emissions estimate for new equipment, customers can refer to the New Source Performance Standard (NSPS) 40CFR60, subpart KKKK, where the allowable NOx emissions level for ambient temperatures < 0°F (–20°F) is 150 ppm NOx at 15% O₂. For pre-February 18, 2005, *SoLoNOx* combustion turbines subject to 40CFR60 subpart GG, a conservative estimate is the appropriate subpart GG emissions level. Subpart GG levels range from 150 to 214 ppm NOx at 15% O₂ depending on the turbine model.

Table 3 summarizes emissions levels for ambient temperatures below –20°F (–29°C) for the *Titan 250*.

Table 1. Warrantable Emissions Between 0°F and –20°F (–20° to –29°C) for New Production

Turbine Model	Fuel System	Fuel	Applicable Load	NOx, ppm	CO, ppm	UHC, ppm
<i>Centaur 50</i>	Gas Only	Gas	50 to 100% load	42	100	50
	Dual Fuel	Gas	50 to 100% load	72	100	50
<i>Taurus™ 60</i>	Gas Only or Dual Fuel	Gas	50 to 100% load	42	100	50
<i>Taurus 65</i>	Gas Only	Gas	50 to 100% load	42	100	50
<i>Taurus 70</i>	Gas Only or Dual Fuel	Gas	50 to 100% load	42	100	50
<i>Mars® 90</i>	Gas Only	Gas	50 to 100% load	42	100	50
<i>Mars 100</i>	Gas Only or Dual Fuel	Gas	50 to 100% load	42	100	50
<i>Titan 130</i>	Gas Only or Dual Fuel	Gas	50 to 100% load	42	100	50
<i>Titan 250</i>	Gas Only	Gas	40 to 100% load	25	50	25
	Gas Only	Gas	40 to 100% load	15	25	25
<i>Centaur 50</i>	Dual Fuel	Liquid	65 to 100% load	120	150	75
<i>Taurus 60</i>	Dual Fuel	Liquid	65 to 100% load	120	150	75
<i>Taurus 70</i>	Dual Fuel	Liquid	65 to 100% load	120	150	75
<i>Mars 100</i>	Dual Fuel	Liquid	65 to 100% load	120	150	75
<i>Titan 130</i>	Dual Fuel	Liquid	65 to 100% load	120	150	75

Table 2. Expected Emissions below 0°F (–20°C) for SoLoNOx Combustion Turbines

Turbine Model	Fuel System	Fuel	Applicable Load	NOx, ppm	CO, ppm	UHC, ppm
<i>Centaur 40</i>	Gas Only or Dual Fuel	Gas	80 to 100% load	120	150	50
<i>Centaur 50</i>	Gas Only	Gas	50 to 100% load	120	150	50
	Dual Fuel	Gas	50 to 100% load	120	150	50
<i>Taurus 60</i>	Gas Only or Dual Fuel	Gas	50 to 100% load	120	150	50
<i>Taurus 65</i>	Gas Only	Gas	50 to 100% load	120	150	50
<i>Taurus 70</i>	Gas Only or Dual Fuel	Gas	50 to 100% load	120	150	50
<i>Mars 90</i>	Gas Only	Gas	80 to 100% load	120	150	50
<i>Mars 100</i>	Gas Only or Dual Fuel	Gas	50 to 100% load	120	150	50
<i>Titan 130</i>	Gas Only or Dual Fuel	Gas	50 to 100% load	120	150	50
<i>Centaur 40</i>	Dual Fuel	Liquid	80 to 100% load	120	150	75
<i>Centaur 50</i>	Dual Fuel	Liquid	65 to 100% load	120	150	75
<i>Taurus 60</i>	Dual Fuel	Liquid	65 to 100% load	120	150	75
<i>Taurus 70</i>	Dual Fuel	Liquid	65 to 100% load	120	150	75
<i>Mars 100</i>	Dual Fuel	Liquid	65 to 100% load	120	150	75
<i>Titan 130</i>	Dual Fuel	Liquid	65 to 100% load	120	150	75

Table 3. Expected Emissions below –20°F (–29°C) for the Titan 250 SoLoNOx Combustion Turbine

Turbine Model	Fuel System	Fuel	Applicable Load	NOx, ppm	CO, ppm	UHC, ppm
<i>Titan 250</i>	Gas Only	Gas	40 to 100% load	70	150	50

COLD AMBIENT PERMITTING STRATEGY

There are several permitting options to consider when permitting in cold ambient climates. Customers can use a tiered permitting approach or choose to permit a single emission rate over all temperatures. Historically, most construction and operating permits were silent on the ambient temperature boundaries for SoLoNOx operation.

Some customers have used a tiered permitting strategy. For purposes of compliance and annual emissions inventories, a digital thermometer is installed to record ambient temperature. The amount of time is recorded that the ambient temperature falls below 0°F. The amount of time below 0°F is then used with the emissions estimates shown in Tables 1 and 2 to estimate “actual” emissions during sub-zero operation.

A conservative alternative to using the NOx values in Tables 1, 2 and 3 is to reference 40CFR60 subpart KKKK, which allows 150 ppm NOx at 15% O₂ for sub-zero operation.

For customers who wish to permit at a single emission rate over all ambient temperatures, inlet air heating can be used to raise the engine inlet air temperature (T₁) above 0°F. With inlet air heating to keep T₁ above 0°F, standard emission warranty levels may be offered.

Inlet air heating technology options include an electric resistance heater, an inlet air to exhaust heat exchanger and a glycol heat exchanger.

If an emissions warranty is desired and ambient temperatures are commonly below –20°F (–29°C), inlet air heating can be used to raise the turbine inlet temperature (T₁) to at least –20°F. In such cases, the values shown in Table 1 can be warranted for new production.

EMISSIONS ESTIMATES IN NON-SOLONOX MODE (LOW LOAD)

At operating loads < 50% (<40% load for the *Titan* 250) on natural gas fuel and < 65% (< 80% load for *Centaur* 40) on liquid fuels, SoLoNOx engines are controlled to increase stability and transient response capability. The control steps that are required affect emissions in two ways: 1) pilot fuel flow is increased, increasing NOx emissions, and 2) airflow through the combustor is increased, increasing CO emissions. Note that the load levels are approximate. Engine controls are triggered either by power output for single-shaft engines or gas producer speed for two-shaft engines.

A conservative method for estimating emissions of NOx at low loads is to use the applicable NSPS: 40CFR60 subpart GG or KKKK. For projects that commence construction after February 18, 2005, subpart KKKK is the applicable NSPS and contains a NOx level of 150 ppm @ 15% O₂ for operating loads less than 75%.

Table 4 provides estimates of NOx, CO, and UHC emissions when operating in non-SoLoNOx mode for natural gas or liquid fuel. The estimated emissions can be assumed to vary linearly as load is decreased from just below 50% load for natural gas (or 65% load for liquid fuel) to idle.

The estimates in Table 4 apply for any product for gas only or dual fuel systems using pipeline quality natural gas. Refer to Product Information Letter 205 for *Mercury* 50 emissions estimates.

Table 4. Estimated Emissions in non-SoLoNOx Mode

Ambient	Fuel System	Engine Load	NOx, ppm	CO, ppm	UHC, ppm
Centaur 40/50, Taurus 60/65/70, Mars 90/100, Titan 130					
≥ -20°F (-29°C)	Natural Gas	Less than 50%	70	8,000	800
		Idle	50	10,000	1,000
< -20°F (-29°C)	Natural Gas	Less than 50%	120	8,000	800
		Idle	120	10,000	1,000
Titan 250					
≥ -20°F (-29°C)	Natural Gas	Less than 40%	50	25	20
		Idle	50	2,000	200
< -20°F (-29°C)	Natural Gas	Less than 40%	70	150	50
		Idle	70	2,000	200
Centaur 50, Taurus 60/70, Mars 100, Titan 130					
≥ -20°F (-29°C)	Liquid	Less than 65%	120	1,000	100
		Idle	120	10,000	3,000
< -20°F (-29°C)	Liquid	Less than 65%	120	1,000	150
		Idle	120	10,000	3,000
Centaur 40					
≥ -20°F (-29°C)	Liquid	Less than 80%	120	1,000	100
		Idle	120	10,000	3,000
< -20°F (-29°C)	Liquid	Less than 80%	120	1,000	150
		Idle	120	10,000	3,000

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Volatile Organic Compound, Sulfur Dioxide, and Formaldehyde Emission Estimates

Leslie Witherspoon
Solar Turbines Incorporated

PURPOSE

This Product Information Letter summarizes methods that are available to estimate emissions of volatile organic compounds (VOC), sulfur dioxide (SO₂), and formaldehyde from gas turbines. Emissions estimates of these pollutants are often necessary during the air permitting process.

INTRODUCTION

In absence of site-specific or representative source test data, Solar refers customers to a United States Environmental Protection Agency (EPA) document titled "AP-42" or other appropriate EPA reference documents. AP-42 is a collection of emission factors for different emission sources. The emission factors found in AP-42 provide a generally accepted way of estimating emissions when more representative data are not available. The most recent version of AP-42 (dated April 2000) can be found at:

<http://www.epa.gov/ttn/chief/ap42/ch03/index.html>

Solar does not typically warranty the emission rates for VOC, SO₂ or formaldehyde.

Volatile Organic Compounds

Many permitting agencies require gas turbine users to estimate emissions of VOC, a subpart of the unburned hydrocarbon (UHC) emissions, during the air permitting process. Volatile organic compounds, non-methane hydrocarbons (NMHC), and reactive organic gases (ROG) are some of the many ways of referring to the non-methane (and non-ethane) portion of an "unburned hydrocarbon" emission estimate.

For natural gas fuel, Solar's customers use 10-20% of the UHC emission rate to represent VOC

emissions. The estimate of 10-20% is based on a ratio of total non-methane hydrocarbons to total organic compounds. The use of 10-20% provides a conservative estimate of VOC emissions. The balance of the UHC is assumed to be primarily methane.

For liquid fuel, it is appropriate to estimate that 100% of the UHC emission estimate is VOC.

Sulfur Dioxide

Sulfur dioxide emissions are produced by conversion of sulfur in the fuel to SO₂. Since Solar does not control the amount of sulfur in the fuel, we are unable to predict SO₂ emissions without a site fuel composition analysis. Customers generally estimate SO₂ emissions with a mass balance calculation by assuming that any sulfur in the fuel will convert to SO₂. For reference, the typical mass balance equation is shown below.

Variables: wt % of sulfur in fuel
Btu/lb fuel (LHV*)
MMBtu/hr fuel flow (LHV)

$$\frac{\text{lb SO}_2}{\text{hr}} = \left(\frac{\text{wt\% Sulfur}}{100} \right) \left(\frac{\text{lb fuel}}{\text{Btu}} \right) \left(\frac{10^6 \text{ Btu}}{\text{MMBtu}} \right) \left(\frac{\text{MMBtu fuel}}{\text{hr}} \right) \left(\frac{\text{MW SO}_2}{\text{MW Sulfur}} \right)$$

As an alternative to the mass balance calculation, EPA's AP-42 document can be used. AP-42 (Table 3.1-2a, April 2000) suggests emission factors of 0.0034 lb/MMBtu for gas fuel (HHV*) and 0.033 lb/MMBtu for liquid fuel (HHV).

*LHV = Lower Heating Value; HHV = Higher Heating Value

Formaldehyde

In gas turbines, formaldehyde emissions are a result of incomplete combustion. Formaldehyde

in the exhaust stream is unstable and very difficult to measure. In addition to turbine characteristics including combustor design, size, maintenance history, and load profile, the formaldehyde emission level is also affected by:

- Ambient temperature
- Humidity
- Atmospheric pressure
- Fuel quality
- Formaldehyde concentration in the ambient air
- Test method measurement variability
- Operational factors

The emission factor data in Table 1 is an excerpt from an EPA memo: "Revised HAP Emission

Factors for Stationary Combustion Turbines, 8/22/03." The memo presents hazardous air pollutant (HAP) emission factor data in several categories including: mean, median, maximum, and minimum. The emission factors in the memo are a compilation of the HAP data EPA collected during the Maximum Achievable Control Technology (MACT) standard development process. The emission factor documentation shows there is a high degree of variability in formaldehyde emissions from gas turbines, depending on the manufacturer, rating size of equipment, combustor design, and testing events. To estimate formaldehyde emissions from gas turbines, users should use the emission factor(s) that best represent the gas turbines actual / planned operating profile. Refer to the memo for alternative emission factors.

Table 1. EPA's Total HAP and Formaldehyde Emission Factors for <50 MW Lean-Premix Gas Turbines burning Natural Gas

(Source: Revised HAP Emission Factors for Stationary Combustion Turbines, OAR-2002-0060, IV-B-09, 8/22/03)

Pollutant	Engine Load	95% Upper Confidence of Mean, lb/MMBtu HHV	95% Upper Confidence of Data, lb/MMBtu HHV	Memo Reference
Total HAP	> 90%	0.00144	0.00258	Table 19
Total HAP	All	0.00160	0.00305	Table 16
Formaldehyde	> 90%	0.00127	0.00241	Table 19
Formaldehyde	All	0.00143	0.00288	Table 16

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Emission Estimates at Start-up, Shutdown, and Commissioning for SoLoNOx Combustion Products

Leslie Witherspoon
Solar Turbines Incorporated

PURPOSE

The purpose of this Product Information Letter (PIL) is to provide emission estimates for start-up and shutdown events for *Solar*[®] gas turbines with *SoLoNOx*[™] dry low emissions combustion systems. The commissioning process is also discussed.

INTRODUCTION

The information presented in this document is representative for both generator set (GS) and compressor set/mechanical drive (CS/MD) combustion turbine applications. Operation of duct burners and/or any add-on control equipment is not accounted for in the emissions estimates. Emissions related to the start-up, shutdown, and commissioning of combustion turbines will not be guaranteed or warranted.

Combustion turbine start-up occurs in one of three modes: cold, warm, or hot. On large, utility size, combustion turbines, the start-up time varies by the “mode”. The start-up duration for a hot, warm, or cold *Solar* turbine is less than 10 minutes in simple-cycle and most combined heat and power applications.

Heat recovery steam generator (HRSG) steam pressure is usually 250 psig or less. At 250 psig or less, thermal stress within the HRSG is minimized and, therefore, firing ramp-up is not limited. However, some combined heat and power plant applications will desire or dictate longer start-up times, therefore emissions assuming a 60-minute start are also estimated.

A typical shutdown for a *Solar* turbine is <10 minutes. Emissions estimates for an elongated shutdown, 30-minutes, are also included.

Start-up and shutdown emissions estimates for the *Mercury*[™] 50 engine are found in PIL 205.

For start-up and shutdown emissions estimates for conventional combustion turbines, landfill gas, digester gas, or other alternative fuel applications, contact Solar's Environmental Programs Department.

START-UP SEQUENCE

The start-up sequence, or getting to *SoLoNOx* combustion mode, takes three steps:

1. Purge-crank
2. Ignition and acceleration to idle
3. Loading / thermal stabilization

During the “purge-crank” step, rotation of the turbine shaft is accomplished with a starter motor to remove any residual fuel gas in the engine flow path and exhaust. During “igni-

tion and acceleration to idle,” fuel is introduced into the combustor and ignited in a diffusion flame mode and the engine rotor is accelerated to idle speed.

The third step consists of applying up to 50% load¹ while allowing the combustion flame to transition and stabilize. Once 50% load is achieved, the turbine transitions to *SoLoNOx* combustion mode and the engine control system begins to hold the combustion primary zone temperature and limit pilot fuel to achieve the targeted nitrogen oxides (NO_x), carbon monoxide (CO), and unburned hydrocarbons (UHC) emission levels.

Steps 2 and 3 are short-term transient conditions making up less than 10 minutes.

SHUTDOWN PROCESS

Normal, planned cool down/shutdown duration varies by engine model. The *Centaur*[®] 40, *Centaur* 50, *Taurus*[™] 60, and *Taurus* 65 engines take about 5 minutes. The *Taurus* 70, *Mars*[®] 90 and 100, *Titan*[™] 130 and *Titan* 250 engines take about 10 minutes. Typically, once the shutdown process starts, the emissions will remain in *SoLoNOx* mode for approximately 90 seconds and move into a transitional mode for the balance of the estimated shutdown time (assuming the unit was operating at full-load).

START-UP AND SHUTDOWN EMISSIONS ESTIMATES

Tables 1 through 5 summarize the estimated pounds of emissions per start-up and shutdown event for each product. Emissions estimates are presented for both GS and CS/MD applications on both natural gas and liquid fuel (diesel #2). The emissions estimates are calculated using empirical exhaust characteristics.

COMMISSIONING EMISSIONS

Commissioning generally takes place over a two-week period. Static testing, where no combustion occurs, usually requires one week and no emissions are expected. Dynamic testing, where combustion will occur, will see the engine start and shutdown a number of times and a variety of loads will be placed on the system. It is impossible to predict how long the turbine will run and in what combustion / emissions mode it will be running. The dynamic testing period is generally followed by one to two days of “tune-up” during which the turbine is running at various loads, most likely within low emissions mode (warranted emissions range).

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¹ 40% load for the *Titan* 250 engine on natural gas. 65% load for all engines on liquid fuel (except 80% load for the *Centaur* 40).

Table 1. Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx Generator Set Applications
10 Minute Start-up and 10 Minute Shutdown
Natural Gas Fuel

Data will NOT be warranted under any circumstances

	Centaur 40 4701S				Centaur 50 6201S				Taurus 60 7901S				Taurus 65 8401S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	0.6	58.1	3.3	359	0.8	75.0	4.3	454	0.8	78.5	4.5	482	0.9	85.8	4.9	523
Total Emissions per Shutdown (lbs)	0.3	25.5	1.5	160	0.4	31.1	1.8	194	0.4	34.7	2.0	217	0.4	38.2	2.2	237

	Taurus 70 10801S				Mars 90 13002S GSC				Mars 100 16002S GSC				Titan 130 20501S				Titan 250 30002S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	1.1	103.9	5.9	634	1.4	129.0	7.4	868	1.6	151.2	8.6	952	2.1	195.6	11.2	1,194	2.5	22.7	1.5	1,925
Total Emissions per Shutdown (lbs)	1.3	110.7	6.3	689	1.7	147.9	8.4	912	1.9	166.8	9.5	1,026	2.4	210.0	12.0	1,303	3.0	19.9	1.5	1,993

Assumes ISO conditions: 59F, 60% RH, sea level, no losses

Assumes unit is operating at full load prior to shutdown.

Assumes natural gas fuel; ES 9-98 compliant.

Table 2. Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx Generator Set Applications
60 Minute Start-up and 30 Minute Shutdown
Natural Gas Fuel

Data will NOT be warranted under any circumstances

	Centaur 40 4701S				Centaur 50 6201S				Taurus 60 7901S				Taurus 65 8401S			
	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2
	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
Total Emissions per Start (lbs)	4.1	219.4	13.0	3,420	5.0	272.4	16.1	4,219	5.7	299.8	17.8	4,780	6.1	326.5	19.3	5,074
Total Emissions per Shutdown (lbs)	1.8	121.1	7.1	1,442	2.3	163.3	9.5	1,834	2.5	163.5	9.6	1,994	2.6	177.2	10.4	2,119

	Taurus 70 10801S				Mars 90 13002S				Mars 100 16002S				Titan 130 20501S				Titan 250 30002S			
	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2
	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
Total Emissions per Start (lbs)	7.6	410.3	24.2	6,164	10.5	570.8	33.7	8,641	11.3	583.5	34.6	9,691	13.8	740.4	43.8	11,495	14.6	75.5	7.3	16,253
Total Emissions per Shutdown (lbs)	3.3	223.0	13.0	2,588	4.3	277.0	16.2	3,685	4.8	308.1	18.0	4,056	6.0	405.3	23.7	4,826	6.2	52.6	4.1	7,222

Assumes ISO conditions: 59F, 60% RH, sea level, no losses.

Assumes unit is operating at full load prior to shutdown.

Assumes natural gas fuel; ES 9-98 compliant.

Table 3. Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx CS/MD Applications
10 Minute Start-up and 10 Minute Shutdown
Natural Gas Fuel

Data will NOT be warranted under any circumstances

	Centaur 40 4702S				Centaur 50 6102S				Taurus 60 7802S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	0.7	64.4	3.7	392	0.8	69.1	4.0	469	0.7	64.3	3.7	410
Total Emissions per Shutdown (lbs)	0.3	30.2	1.7	181	0.4	35.4	2.0	217	0.4	33.0	1.9	204

	Taurus 70 10302S				Mars 90 13002S CSMD				Mars 100 16002S CSMD				Titan 130 20502S				Titan 250 30002S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	0.8	73.1	4.2	519	1.2	109.3	6.2	805	1.4	123.5	7.1	829	1.9	176.9	10.1	1,161	2.6	26.2	1.7	1,794
Total Emissions per Shutdown (lbs)	1.1	93.4	5.3	575	1.5	132.6	7.6	817	1.7	149.2	8.5	920	2.4	207.6	11.9	1,272	2.9	19.1	1.4	1,918

Assumes ISO conditions: 59F, 60% RH, sea level, no losses.

Assumes unit is operating at full load prior to shutdown.

Assumes natural gas fuel; ES 9-98 compliant.

**Table 4. Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx Generator Set
10 Minute Start-up and 10 Minute Shutdown
Liquid Fuel (Diesel #2)**

Data will NOT be warranted under any circumstances

	Centaur 40 4701S				Centaur 50 6201S				Taurus 60 7901S			
	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2
	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
Total Emissions per Start (lbs)	1.3	44.5	7.4	473	1.7	59.0	9.8	601	1.7	59.8	9.9	636
Total Emissions per Shutdown (lbs)	0.6	17.3	2.8	211	0.7	21.2	3.4	256	0.8	23.5	3.8	286

	Taurus 70 10801S				Mars 100 16002S GSC				Titan 130 20501S			
	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2
	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
Total Emissions per Start (lbs)	2.3	78.5	13.0	823	3.4	114.1	18.8	1,239	4.3	147.5	24.4	1,547
Total Emissions per Shutdown (lbs)	2.5	73.6	12.0	889	3.8	111.4	18.1	1,331	4.7	139.1	22.6	1,677

Assumes ISO conditions: 59F, 60% RH, sea level, no losses.

Assumes unit is operating at full load prior to shutdown.

Assumes #2 Diesel fuel; ES 9-98 compliant.

**Table 5. Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx Generator Set
60 Minute Start-up and 30 Minute Shutdown
Liquid Fuel (Diesel #2)**

Data will NOT be warranted under any circumstances

	Centaur 40 4701S				Centaur 50 6201S				Taurus 60 7901S			
	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2
	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
Total Emissions per Start (lbs)	11.7	194.7	30.9	4,255	15.2	271.9	43.3	5,302	14.7	282.6	45.0	5,962
Total Emissions per Shutdown (lbs)	4.4	84.7	13.6	1,816	6.7	164.3	27.0	2,334	6.3	159.0	26.0	2,515

	Taurus 70 10801S				Mars 100 16002S				Titan 130 20501S			
	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2	NOx	CO	UHC	CO2
	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
Total Emissions per Start (lbs)	18.4	360.3	57.4	7,375	29.1	552.0	87.7	11,685	34.4	677.0	108.0	13,731
Total Emissions per Shutdown (lbs)	8.0	207.8	34.1	3,156	12.3	302.6	49.4	4,970	15.0	388.5	63.7	5,876

Assumes ISO conditions: 59F, 60% RH, sea level, no losses.

Assumes unit is operating at full load prior to shutdown.

Assumes #2 Diesel fuel; ES 9-98 compliant.



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station

1 message

Appolon, Ashley <ashley.appolon@richmond.edu>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 4:18 PM

Hello,

My name is Ashley Appolon and I am submitting my comment about the compressor station being built in Buckingham in the form of a word document that is attached.

Sincerely,
Ashley Appolon

PERMIT NAME:

- Minor Source Construction Permit issued under the authority of the Air Pollution Control Board

APPLICANT NAME AND REGISTRATION NUMBER:

- Atlantic Coast Pipeline, LLC; 21599

FACILITY NAME AND ADDRESS:

- ACP – Dominion Energy Buckingham Compressor Station; 5297 S. James River Hwy, Wingina, VA 24599

**Enviro research and comment.docx**

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independent monitoring, corporate compliance, community participation, inclusion of impacted voices, information and justice

Inclusion of impacted Voices

- Public engagement by having cooperate officials meet with residents
- Guided tour of the community lead by a selected community member
 - Company officials should be aware of the community that they are infringing the compressor on
 - Company officials should know about the area and be aware of places that would be at risk for contamination and pollution
- Annual meeting of officials from the company, community officials, experts in health and environmental science and residents to discuss changes made to community due to compressor
 - This meeting would be used to address concerns that residents may have and to answer their questions right then and there
 - The experts in health and environmental science could discuss the impacts of the current emissions
 - The information should be reported in an easily understood language without overly technical terms; there should be translators present if needed

Community Participation

- A study, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3086533/>, found that incorporating community members in the design implementation of changes made to the community often lowers the risk of miscommunication
- Community members should be involved in the placement of environmental testing sites such as air modifiers
 - Members of the community should be asked which areas they feel would be impacted the most if emissions became too high
 -

Information and Justice and Corporate Compliance

- Community members should have access to information pertaining the compressor
 - Online database that notifies resident when emissions are high and what areas are being impacted
 - Assessments from water, air, and soil testing should be made public for community members and that publication should be made in place that can be easily accessed
 - Company officials should be informed about environmental justice issues and show that they are making the effort to learn more and be more aware
 - This can be done by collaborating with environmental justice organization and attending conference that address issues that fall under environmental injustice
 - The company should indicate that they do have an environmental management team
 - That team should interact with the community and be available to communicate with the members of the community

Independent Monitoring

- There should exist monitoring and testing run by experts not affiliated with the company

- This third-party monitoring should share result gather with the community and the company
 - Those results should include the raw data collected and the analysis made on the data
 - The results given to the company should be the same as the results given to the community members
- Air Monitors should be placed in areas around the community
 - Those areas should be selected by the community members
 - There are affordable air monitors that can be placed and are also linked to site that puts out the data collected
- Areas that have high risk individuals should be watched closely
 - Areas such as schools, care facilities, populated neighborhoods

Comment:

The building of a compressor station in the middle of a community that is set in a nature rich environment is too bold to go unnoticed. No matter how low the emissions will be or how careful the builders are in avoiding noise pollution, there will be a negative component added to the community. It can be greatly understood why the members of the community are adamant in their protest against the compressor station. The community belongs to them and they are the ones who must live with the consequences brought by the compressor. With that in mind if the compressor station is built against the wishes of the members, then the company should do everything in their power to make the process community centered. The ways in which the company can accomplish that is through the integration of the members of the community in the details of the compressor station's impact. The officials of the company should interact with the community by first learning about the people and places located there. This can be done by taking a guided tour lead by a community member. A tour would give the company an idea about what would be at stake if there was an accident at the station. The company should feel a sense of responsibility and be aware of the parts of the community that is not noted in documents. In order to avoid miscommunication, the company should meet annually with the community members and discuss concerns dealing with the compressor station. It would be helpful to have their party experts in the fields of health environmental science be in attendance as well to provide clarification on any of the issues presented. State officials should be in attendance as well to show that they are aware of the circumstance surrounding the community. Community participation not only aides the members of the community, it also helps the company created detailed plans that properly reflect the needs of the community. The chances of accidents are then decreased, and the company can receive different perspectives and inputs. Third party analysis of the emissions gets rid of any bias that may have been in past reports. Those results should be available to the company as well as the community members. Both the raw data and analyzed data should be provided to both parties.



Air Division 1, rr <airdivision1@deq.virginia.gov>

ACP air permit

1 message

David Ball <dwb57@aol.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 11:55 PM

Dear DEQ:

I attended and spoke at Buckingham County. Here is my letter with comments and questions. I plan to attend the hearing in November.

Thanks,
David Ball



DWB to DEQ - ACP AQ Permit letter 9-21-18.docx
19K

DAVID W. BALL

September 21, 2018

VIA EMAIL

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)
PIEDMONT REGIONAL OFFICE
BUCKINGHAM COMPRESSOR STATION
4949-A COX ROAD
GLEN ALLEN, VA 23060
airdivision1@deq.virginia.gov

RE: ACP Union Hill Compressor Station, Buckingham County, VA

Dear David Paylor:

First off, the Governor issued a 'State of Emergency' due to Hurricane Florence. Every other state agency was authorized to extend their due dates by one week as a result. Will DEQ follow suit and extend the comment period due to the Governor's State of Emergency? There is legal precedence for such an action.

Secondly, I would like to know why DEQ is wasting taxpayer money and State resources on Dominion's Atlantic Coast Pipeline (ACP) since the application is being held up in Federal Court. You should be aware that the permit application cannot be segmented to convenience the applicant or Virginia. In order to separate the ACP into stages, phases or smaller projects, Dominion's ACP would have to be resubmitted as a new permit application to Federal Energy Regulatory Commission (FERC). This would start the application process from the beginning as required by Federal Law and Regulations. So explain why DEQ is moving forward when this project might not happen?

I would ask that DEQ do a comprehensive quantitative risk assessment for air and water quality prior to, during construction and while in post construction operation of the hazardous health and environmental impacts of the compressor station on the residents of the established Historic Slave-Freedman community situated in the surrounding area to the compressor station and Buckingham County geographically. The current ambient air quality testing is flawed and an inaccurate method of modeling the theoretical and net impacts on residents in the affected area.

Any air quality modeling and testing needs to include the anticipated range of toxic chemical pollutants that will be discharged by the compressor station during a blowdown. These toxic chemical pollutants would include but not be limited to NO₂, hydrogen sulfide, carbonyls, formaldehyde, acetaldehyde, benzene, carbon tetrachloride, chloroform, 1,2-DCA, 1,1,2-trichloroethane, croton-aldehyde, 1-methoxy-2-propanone, and other volatile organic compounds (VOC). The detrimental health effects of these toxins are well documented and known. Formaldehyde alone is an embalming agent that will necrotize flesh on contact or its vapors will do the same to lung tissue if one breathes it directly. What do you plan to do to protect the air we breathe?

The collection, storage and removal of ammonia and fly ash need to be addressed. How will DEQ handle this concern? What actions, fines and penalties will be imposed on Dominion and ACP?

When I first examined the proposed ACP in early 2015, I questioned its design as being poorly conceived with many inherent problems. I pointed out to Mr. Toms that the many turns and angles would create drag in the pipeline. There would be high and low pressure sides in these turns affecting flow. Hard angles would cause turbidity in the pipeline reducing laminar flow. He dismissed my comments which I

DAVID W. BALL

knew to be factual if one had studied the physics of fluids and been involved in pipeline construction. Which I have done both. Consequently, Dominion must have taken my comments to heart because the compressor station went from a three engines 36,000 horse power to four engines 57,000 horse power station a year later. What is DEQ going to do if this compressor station is approved and a fifth engine is added making it a 71,000 horse power compressor station?

Let's consider the climate and weather of the region. Weather plays a significant role in the air we breathe. Remember, there are 4 distinct seasons. Summers are notoriously hot and humid. It is very common for a **Bermuda High** to sit for weeks influencing our weather. In weather, high pressure is sinking and expanding horizontally with little or no air flow. Pollutants become trapped close to the ground and linger as heavy smog because they are heavier than air. As the Bermuda high persists, the pollutant smog becomes denser creating an unhealthy atmosphere for breathing. Eventually, the pollutant smog would flow into stream valleys and settle on the James River.

Since Virginia's prevailing political position is the '**Global Warming**' is real, does DEQ take into account that climate is warming which means more **Bermuda Highs**? What measure does DEQ take to protect its citizens in Union Hill and Buckingham as a whole? If you are familiar with West Point, Virginia, the stench from there can be carried on the wind and be smelled in Williamsburg. How do you keep that toxic smog from impacting surrounding counties or even reaching Richmond?

If you tried to confine the pollutants by putting a wall or high berm around the compressor station, it would become deadly and caustic. The only way anyone would be able to serve the compressor station in that scenario would be in a hazmat suit with oxygen masks. Without that protection, the contaminated air would kill them. In summer, the compressor station will be working at capacity pumping more toxins into the air we breathe. What will you do to protect the people you were hired to serve?

In Spring, the rains would wash the pollutants out of the air into the ground and runoff water. Plants and animals will consume these toxins and contaminate the food supply. How will you clean the soil and water of this contamination? What will you do to compensate farms impacted by these toxic pollutants?

Come Fall, winds will blow the contaminated air everywhere. Who will be spared? Do you even care?

The winter is no different. The colder it gets. The heavier the pollutants get. The process is called rarefaction. The heavier pollutants get heavier as they near their melting and/or boiling point temperatures settling them at or near the ground. Up high the air is clear but near the ground it's not. The toxic winter smog creeps into basements, wells, on frozen ponds and streams. How do you escape it? What does DEQ do when it is no longer safe to live in your home? Or to drink your water? What do the foresters do when the pine trees die off because they are more sensitive to the toxic smog? Who compensates the pine tree farms? Or the businesses that depend on the pine they grow? What do the hunters do when the deer and wild turkey are gone? Who will absorb the cost of a lost economy? Who will care for the sick and pay their bills when the toxic smog steals their health and happiness?

FERC approved Transco plan to meet the demand for the Northeastern states without the ACP. Dominion plans to use thin pipe in rural areas. Considering their design flaws, it poses a serious threat to the safety and well-being of residents in Buckingham County. The potential for pipe leaks is enhanced by the increased seismic activity in the region. Dominion has converted most all of their existing power plants to natural gas using existing supply lines. The investor news has reported Dominion buying into the Mountain Valley Pipeline (MVP). Dominion has two billion invested in the ACP

DAVID W. BALL

that may never be built. They lost the pipeline race. Do we need to approve what we don't need or want?

Sincerely,

David W. Ball



Deny the Buckingham Compressor Station air permit

1 message

Ambika BERTHIAS <ambika@orange.fr>

Fri, Sep 21, 2018 at 5:04 AM

Reply-To: ambika@orange.fr

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

I respectfully urge you to deny the draft minor source air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station.

This compressor station poses a direct threat to our climate, our air quality, and - most importantly - to the lives of the historic freedman and largely African American Union Hill community. If built, the compressor station would emit methane, nitrogen oxides, volatile organic compounds and particulate matter into the air in close range to community members' homes and would be a stark example of environmental racism at play in the Commonwealth.

We ask that you deny this permit and request that the following concerns be addressed:

- DEQ and the Air Board must ensure that the permit for the Buckingham Compressor Station does not disproportionately impact marginalized communities. However, the vast majority of residents in close proximity to the proposed compressor station site - 85% - are people of color, and a large proportion are elderly or very young. Therefore, a disproportionate impact on an environmental justice community is virtually guaranteed. If the project cannot be modified to avoid this outcome, the air permit should be denied.
- ACP has not shown that the amount of toxic air emissions from the compressor will not cause or contribute to the endangerment of human health. DEQ should conduct a baseline Health Impact Assessment to better understand what ailments already exist in the community that could be exacerbated by these emissions. The elderly, very young, and community members who already have respiratory health issues are particularly at risk.
- DEQ should require ACP to continuously monitor nitrogen oxide emissions to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ should conduct further analysis of the greenhouse gas emissions associated with this proposed compressor station. While Virginia is poised to begin regulating carbon dioxide emissions from electric power plants, ignoring the greenhouse gas emissions from the infrastructure used to supply those power plants is self-defeating. With each new pipeline and compressor station built, significant amounts of methane are emitted into the atmosphere, exacerbating climate change impacts. Though methane does not last in the atmosphere nearly as long as carbon dioxide, methane is much more efficient at capturing radiation than carbon dioxide and, pound for pound, the comparative impacts of methane to carbon dioxide are 25 times greater over a 100 year period. Greenhouse gas emissions are mentioned in the draft air permit, but further analysis of impacts and plans to mitigate those emissions are necessary.
- ACP has not adequately addressed emergency response plans. Detailed plans should be drafted and shared with the community. These plans should outline evacuation and actions in response to an explosion or other emergency at the Buckingham compressor station. At this time, there is no certainty that residents could be evacuated promptly, and Buckingham County emergency responders do not have the supplies or resources to respond to a significant industrial emergency.

It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station. I urge you to deny the permit.

Sincerely,

Ambika BERTHIAS
6 ALLEE DES ORMEAUX,
Saint-Cyr/Loire, ot 37540 Fr.
02 47 41 17 32



Air Division 1, rr <airdivision1@deq.virginia.gov>

BCS air permit comments

1 message

Heidi <heidi1008@gmail.com>

Fri, Sep 21, 2018 at 3:30 PM

To: "Air Division 1, rr" <airdivision1@deq.virginia.gov>, "Dowd, Michael" <michael.dowd@deq.virginia.gov>, patrick.corbett@deq.virginia.gov

Please see my attached comments. Thank you.

Heidi Dhivya Berthoud

Secretary Friends of Buckingham

info@friendsofbuckinghamva.org<http://www.friendsofbuckinghamva.org/><https://www.facebook.com/ProtectBuckingham>

Cell 434 979 9732

**Comments BCS air permit HDB 9-21-18.pdf**

738K

Air permit comments about the proposed Buckingham Compressor Station

Heidi Dhivya Berthoud 9-21-2018

heidi1008@gmail.com

434 979 9732

366 Wyland Rd

Buckingham VA 23921

Our home is high on a bluff overlooking the James River and out towards the Blue Ridge. As I write, I sit on our southwest deck, my 3 season outdoor office, with my 3 feline assistants, who inspire deep purpose in all that I do. We are about 6 miles from the proposed BCS, and about 1 mile downstream from the proposed HDD crossing; the HDD would be just upstream from Yogaville. I am part of the Yogaville Community. I enjoy the quiet and clean air of my country abode with my husband, 3 cats and wildlife. I speak for my family, and also as a member of Friends of Buckingham.

DEQ and Dominion assure us this compressor station would be the best in class, meeting all regulations. We like our air and water clean and we don't want the tons of pollutants dumped on us that the 'regulations' say are okay.

We ask for a 30-day extension of the comment period.

Please deny this permit and immediately delay until the issues below are properly addressed.

At the air permit public hearing at Buckingham Middle School on 9/11/18 we came to understand from Attorney David Neal's comments [Southern Environmental Law Center - SELC] that the SAPCB has extended capacities and obligations beyond the DEQ air department's narrow scope of technical evaluation of the compressor station. This is also beyond the scope of the SWCB. Thus SAPCB has a hefty and wider scope of responsibility to which I now appeal.

It is the responsibility of the Air Pollution Control Board to consider:

"2010 Code of Virginia, Title 10.1 - CONSERVATION. Chapter 13 - Air Pollution Control Board (10.1-1300 thru 10.1-1328) § 10.1-1307. Further powers and duties of Board.

E. The Board in making regulations and in approving variances, control programs, or permits, and the courts in granting injunctive relief under the provisions of this chapter, **shall consider** facts and circumstances relevant to the reasonableness of the activity involved and the regulations proposed to control it, including:

1. The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused;
2. The social and economic value of the activity involved;
3. The suitability of the activity to the area in which it is located;"

I will address this statute's 3 sections below.

I. The character and degree of injury to, or interference with, safety, health, or the reasonable use of property, which is caused or threatened to be caused.

Dominion repeatedly asserts that safety is their first priority, to us, to their stockholders, in their green-washed advertising. For 4 years now we have asked for, and have yet to see evacuation plans. I appeal to the SAPCB to not allow approval of an air permit without considering health and safety first – it appears to be your number one directive. Worst-case scenarios must be addressed. The Red Cross could easily help figure things out, and they are motivated; even if our elected officials are not. We don't want anyone to live near a high pressure 57,000+ hp compressor station, which is highly explosive [methane is not only highly explosive, it is also 86 x more of a green house gas & ozone destroyer than CO2 Scientific American, December 2015 <https://www.scientificamerican.com/article/how-bad-of-a-greenhouse-gas-is-methane/%5D>, highly toxic, and an easy terrorist target.

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On September 12, 2018, the [Northam Administration Takes New Steps to Fight Climate Change, Ocean Acidification](https://www.governor.virginia.gov/newsroom/all-releases/2018/september/headline-829610-en.html), <https://www.governor.virginia.gov/newsroom/all-releases/2018/september/headline-829610-en.html> That's so encouraging. But! No-where does he talk about canceling the ACP and MVP. This is the behavior of insanity.

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At a Virginia Environmental Justice Coalition [VEJC] meeting with the DEQ air department on 9/20/2018, I talked with Mike Dowd about this, and how it took some environmentalists to point an infrared camera at pipeline infrastructure to show the methane leakage that industry was not admitting to. He said, he wished DEQ could afford those cameras. In this meeting, the DEQ made clear to us how under staffed and funded they are. Their goal is to have 50 staffers, whereas now they have 38, and it takes 2 ½ years to get a permit reviewer up to speed. That's worrisome.

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Matt Strickland just attended a climate summit in California, where Gov Brown signed a pledge for California to go 100% renewable by 2045. We can't do that AND have any new pipelines.

My life work is on the preventative end of the spectrum. I am a massage and yoga therapist and teacher and a retired dental hygienist. Ralph Northam is a doctor who has pledged the Hippocratic Oath to do no harm. He lives a very conflicted life, because by not denying these pipelines he is incurring immediate local, regional and global damages, disease and death by allowing the poisoning of our air, water, land, health. I say the SAPCB has the obligation and power to protect us from his wavering inaction.

I am the secretary for Friends of Buckingham [FoB], but as is the case in volunteer grassroots organizations, I am also the Baseline Testing Project Manager. At the VEJC/DEQ meeting on 9/20/18, the DEQ expressed great interest in the baseline testing that we are doing. We have asked that:

Prior to permitting, the DEQ must require and complete a Quantified Risk Assessment (QRA) and work with other state agencies to conduct a Health Risk Assessment (HRA) and a Health Impact Assessment (HRI). This would counter the compartmentalization of hazards to water from hazards to air, from safety, environmental justice, health impacts from each different 'class' of toxic pollutants and emissions and site suitability.

As Baseline Testing Project Manager for FoB, I went to the local, then regional health departments to ask for assessments. They sent me on to you, the DEQ, who also said no. We were left to defend for ourselves. Thus we did the right thing, taking up the huge project of testing 30 well water sites close to the 26 miles of proposed ACP in Buckingham. We have done air monitoring for PM, VOC's, formaldehyde and H2S, in 8 homes around the compressor station site and are in process with health surveys. We are

also monitoring the 36 streams crossings by the ACP, including 7 flood plains, which is part of the collaborative Pipeline CSI program mentioned above.

This testing should be a standard requirement for any potentially polluting industry. But for this to be a regulatory requirement, would be an admission of the dangers. I also understand that these projects are very costly. We have written and received grants for this project for a mere \$40,000, but its all volunteer labor doing the legwork. I agreed to send links to our website, which we have the intention of sharing with all who are working to protect their air, water, land, health.

<http://www.friendsofbuckinghamva.org/friends/baseline-testing-for-well-water/>

<http://www.friendsofbuckinghamva.org/friends/baseline-testing-a-compilation-of-resources/>

This is the program FoB is following: **Citizen Science Toolkit**, http://www.friendsofbuckinghamva.org/friends/wp-content/uploads/2017/04/SWEHPCitizen_Science_Toolkit.pdf, created by **Southwest Pennsylvania Environmental Health Project [SWPA-EHP]**, <https://www.environmentalhealthproject.org/>. This toolkit was just recently created in 2018 for communities afflicted by oil and gas development.

We consulted extensively with Eric Faisst, Director of the Madison County Health Department, who shepherded the only public comprehensive baseline testing project on the planet, which was a harmonic convergence of many unusual circumstances, not the least important, is that Eric's background is in environmental health, and that 2 members of the Madison County Board of Supervisors requested it [Buckingham Supervisors sold us out, laid out the red carpet for Dominion who has been essentially bribing the community for years. There were 87 comments against the SUP for the BCS, 4 in favor]. Eric collaborated with SWPA-EHP. He has offered to confer with Virginia State government on the work he is doing. Please take him up on it. Let me know if I can cheerlead that process by directing me to the most effective department.

Madison County (NY) Health Department Baseline Community Environmental Monitoring Results. **Madison Cty, NY, Dept Health – compressor station testing**, <http://www.friendsofbuckinghamva.org/friends/wp-content/uploads/2017/04/1Madison-Cty-NY-Dept-Health-compressor-station-testing.pdf>, for a 36-page report including well, surface waters, air, noise.

II. The social and economic value of the activity involved. The owners of Transco Pipeline have said there are enough pipelines in place to meet demand. THESE PIPELINES ARE NOT NEEDED. It is well known that renewables are far more economical than fossil fuels, nuclear.

SAPCB, I urge you to weigh in on this essential issue that seems to be first and foremost concern of many who may not be convinced [uneducated] about the environmental,

environmental justice, safety and health risks, which all have their costs, which are not even factored into the costs, as the industry would not bear them, the ratepayers would.

Unnecessary high capacity natural gas pipelines are being built across our nation. Investors will continue to build pipelines as long as there is an outdated federal policy guaranteeing at least a 14% rate of return with no risk.

Economy:

- On average [only 54% of existing natural gas pipeline infrastructure](https://www.nrdc.org/experts/amy-mall/natural-gas-industry-admits-new-pipelines-arent-needed) is being used
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- CEO & President of the South Carolina Small Business Chamber of Commerce, Frank Knapp, [warned that Dominion Energy was misleading the public at a press conference, https://scsbc.org/about/president-and-ceo-frank-knapp/](https://scsbc.org/about/president-and-ceo-frank-knapp/). He also said Virginia was paying for a pipeline they didn't need
- Cost of the new pipelines will make energy costs rise by 30% or more
- Higher energy costs will strain businesses and put jobs at risk
- [Renewables are on track to produce energy cheaper than fossil fuels, https://www.forbes.com/sites/dominicdudley/2018/01/13/renewable-energy-cost-effective-fossil-fuels-2020/-2049127d4ff2](https://www.forbes.com/sites/dominicdudley/2018/01/13/renewable-energy-cost-effective-fossil-fuels-2020/-2049127d4ff2)
- [Tesla Giant Powerpack Battery reduced energy costs by 90% in Australia, https://electrek.co/2018/05/11/tesla-giant-battery-australia-reduced-grid-service-cost/](https://electrek.co/2018/05/11/tesla-giant-battery-australia-reduced-grid-service-cost/)

Three excellent papers on the economics of these pipelines at FoB site:
<http://www.friendsofbuckinghamva.org/friends/economics-of-the-pipelines-3-papers-by-tom-hadwin/>

To Understand Pipeline Economics Follow the Money
Excerpts from Comments to the SCC_Aug17-2018
[Hadwin-Comments_Air-Quality-Permit-Buckingham-Compressor-Station](#)

The above articles are authored by Thomas Hadwin. Mr. Hadwin worked in electric and gas utilities in Michigan and New York. He led a multi-disciplinary team responsible for siting and gaining regulatory approval of multi-billion dollar projects. The group was also responsible for assuring that company facilities complied with state and federal environmental regulations.

He also served as a tech entrepreneur, national business consultant and educator.

You can also go to this site for more articles, which is produced by the [Friends of the Central Shenandoah Valley](http://www.censhen.org/), <http://www.censhen.org/>. Contact: tomh@censhen.org

III. The suitability of the activity to the area in which it is located

Excerpts from 2 papers by Lakshmi Fjord, PhD on FoB website.

FoB Critical Questions BCS Air Permit 9-18-18

<http://www.friendsofbuckinghamva.org/friends/wp-content/uploads/2018/09/FoB-Critical-Questions-BCS-Air-Permit-9-18-18.pdf>

UH Household Study Stats Sheet 9-18 9-18

<http://www.friendsofbuckinghamva.org/friends/wp-content/uploads/2018/09/UH-Household-Study-Stats-Sheet-9-18-9-18.pdf>

Unsuitability of Union Hill, Buckingham VA as only ACP Virginia compressor station site

Dominion has consistently used misinformation about the factual population, race, and omission of historic cultural resources in submissions to Buckingham elected representatives, to FERC and DEQ. Misinformation that erases the name of the community, denser populated numbers of people living in close proximity, majority African American race, and erasure of their Former Slave and Freedmen history (as well as former plantation history) has shaped decision-making at every level of ACP's permit processes.

1. Dominion unfairly singled out Buckingham County from all counties along the three state route of ACP to claim it has “no historic resources” whether archaeological or architectural in that segment. Yet in all other counties, completely similar resources of early and mid-20th Century and 19th Century homes, churches and their cemeteries, bridges, dilapidated farm structures and stores, etc. were listed and photographed for 1674 pages. Alone, Buckingham's history was/is denied and erased.

- ❖ In Sept. 18, 2016 ACP filed a 1674 page cultural resource application to FERC. For Buckingham County only, ACP had “no recorded resources identified within the modified project APE” (Appendix D: 31).

- ❖ In March 24, 2016, ACP filed their Addendum of cultural resources. In Appendix D on P. 31, for Buckingham ACP reports only “three [total] resources are “documented within the modified project APE include three single-family dwellings that range in date from circa 1940 to circa 1965 . . . They have no known association with a significant event or person and are not associated with any broad patterns in history.”

Pp. 330, 331, and 332 are photos of that list of homes/addresses: 330 & 331 **are the same home/same photo. 332 is not in Union Hill.** L. Fjord identifies 330/331 – the only cultural resources listed for the whole county of Buckingham - as Theo Haskins' on S. James River Highway, an abandoned trailer next to a modular home, without the family cemetery that adjoins it.

- ❖ That is, Dominion’s contractors had to visibly ignore 99 homes on all sides of the CS 2 site, 2 historic black churches and their cemeteries (Union Hill Baptist est 1868; Union Grove Missionary Baptist est. circa 1920); 1 historic white church and cemetery est. 1831, 2 historic black school sites, the 1880s Freedmen home place of the Harper family next to the proposed CS site, no photos of the Variety Shade tobacco barn or of Shelton Store, which is visible from the road in Union Hill.
- ❖ May 3, 2016, “Union Hill/Woods Corner Rural Historic District” Buckingham, VA was listed by Preservation Virginia as a “Most Endangered Historic Place” in Virginia.
Notification of that listing and its complex of historic resources, marked and unmarked slave burials, churches, cemeteries, former plantation sites, farm structures, homes, photographs, and slave plantation neighborhood history have been part of public record of comments made to the Buckingham Planning Commission, the Buckingham Board of Supervisors, to FERC, by Dr. Lakshmi Fjord, Justin Sarafin and Sonja Ingram of Preservation Virginia since August 2016.

2. Dominion knowingly erased the existence of Union Hill as a known community, and its 99

households visibly within 150ft – 1-mile radius on all sides of their ACP VA compressor

station site. In their 2015 FERC application and in all local and state permit processes both written and submitted at public hearings, ACP used the 2010 census average person per square mile data for the whole of Buckingham County – 29.6 – to report the population for ACP CS 2.

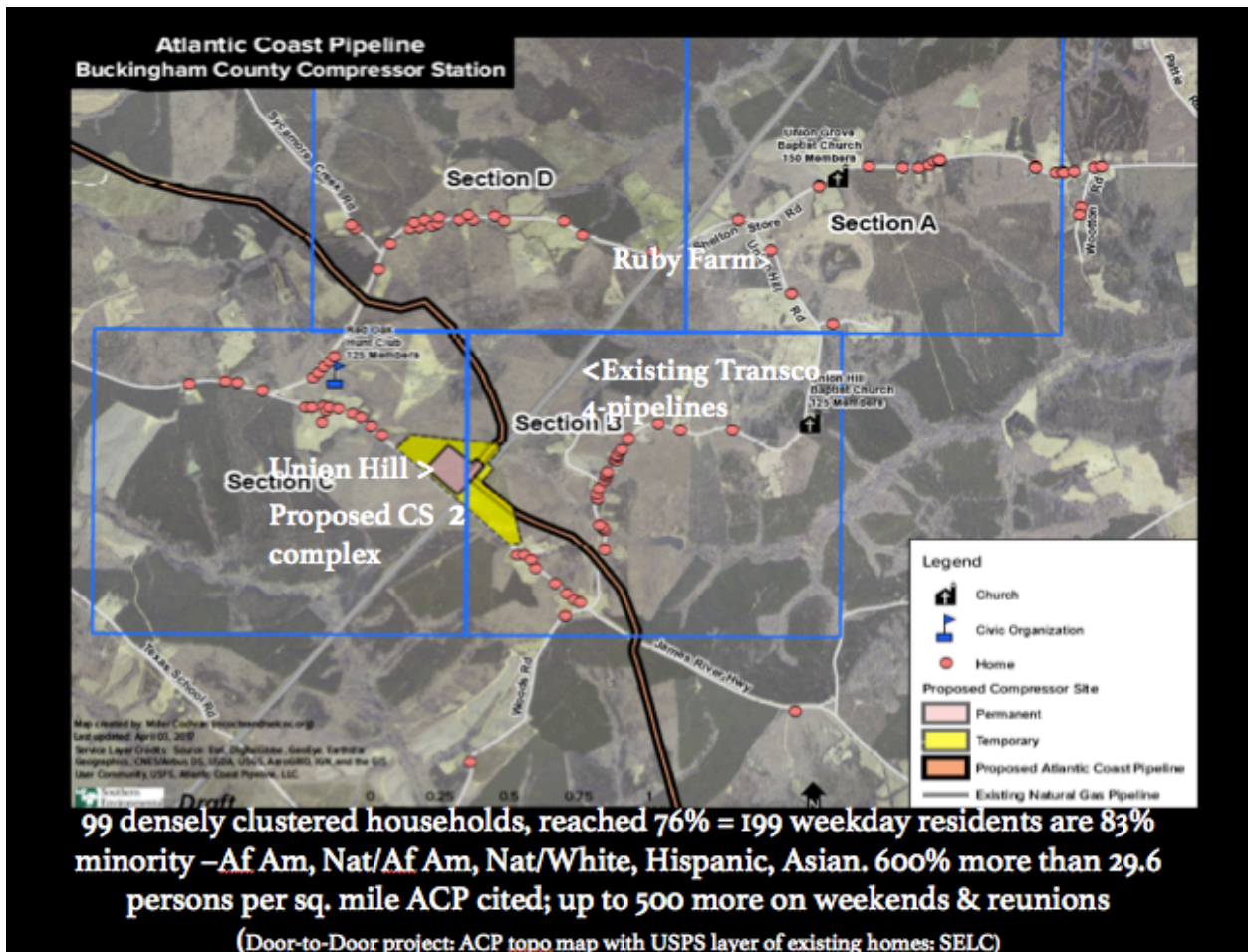
- ❖ On May 30, 2018, the spokeswoman for Dominion to the Governor’s Advisory Council on Environmental Justice claimed “it is the law” to do so -- when National Environmental Protection Act-NEPA guidelines state the opposite is true:

“The fact that census data can only be disaggregated to certain prescribed levels (e.g., census tracts, census blocks) suggests that pockets of minority or low-income communities, including those that may be experiencing disproportionately high and adverse effects, *may be missed in a traditional census tract-based analysis.*” *Caution is called for in using census data due to the possibility of distortion of population breakdowns* ... In addition to identifying the proportion of the population of individual census tracts that are composed of minority individuals, analysts should attempt to identify whether high concentration "pockets" of minority populations are evidenced in specific geographic areas. ... The IWG guidance also advises agencies not to ‘artificially dilute or inflate’ the affected minority population” (1997, 15-16).

- ❖ The Union door-to-door household study of Union Hill designed and conducted by Dr. Lakshmi Fjord (UVa, Dept. of Anthropology) began in August 2016 to uncover the actual 1-mile radius demographic and historic data for the CS 2 site has had 3 stages for a total of 4 months, and ending Sept. 4, 2018. The study follows NIH protocols for health information confidentiality, and community research guidelines. Open-ended interviews of 1-1.5 hours took place in 67 of the 75 households reached. Data includes: factual population, race, ages, pre-existing diagnosed health conditions, family heritage in Union Hill and nearby, and existing economic or food source uses of their land.

ACP's Buckingham CS site map found at dom.com, with a layer of household addresses added by Southern Environmental Law Center based on USPS postal addresses, proves that Dominion always knew and could submit accurately that CS is not "sparsely populated," is not 29.6 people per square mile.

- ❖ There are many cost benefits to Dominion to erase the population of Union Hill. By contravening NEPA guidelines, FERC in ACP's Final Environmental Impact Statement-FEIS reports no environmental justice issues besides low-income for the entire ACP route, which includes Union Hill-sited CS 2 (FEIS 4.9.9.1 Demographic and Economic Data, Vol 4-512). FERC notes their concerns if there were an African American majority population at this site:



“As discussed in section 4.11.1, air pollutants associated with ACP and SHP include increased dust as a result of construction equipment and vehicles, and compressor station emissions, which include carbon monoxide (CO), carbon dioxide (CO₂), methane, and nitrous oxide (NO_x); volatile organic compounds (VOCs); and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns (PM_{2.5}). These air pollutants are known to increase the effects of asthma³¹ and may increase the risk of lung cancer (Nafstad et al., 2003).

Due to high rates of asthma within the overall African American community, we consider this community especially sensitive” (FEIS Vol 4:512)

- ❖ Union Hill household data including revised population, race, and existing diagnostic health conditions, is in the public record to Buckingham elected representatives, 2016-17; to FERC in EIS public comments by Dr. Fjord and by Southern Environmental Law Center (SELC), 2017; by Dr. Fjord in 401 Water permit comments and NW12 Water Board comments, 2017-18.

- ❖ Updated household data (Sept. 3, 2018 updates):
 - 75 of 99 households reached for a 76.5% response rate, an outstanding rate in social science research.
 - 199 weekday residents; with hundreds more on weekends, bimonthly, etc.
 - 83% are minorities: African American, Native American/African American, Native American/White, Hispanic, and Asian
 - 17% are White
 - Children 0-17 are 32%; Elderly are 25%
 - For 67 households, we have listed in the table existing diagnosed health conditions that would be impacted by the combination of emissions applied for at BCS, including particulate matter, radon, volatile organic compounds, and list of EPA emissions DEQ lists in their draft air permit for ACP.
 - Known pre-existing diagnoses at Union Hill, include diabetes, asthma and other lung conditions, chronic bronchitis and pneumonia, heart conditions, breast and other cancers, COPD, lupus, kidney disease, epilepsy, multiple sclerosis, brain tumor, migraines from 35 households in our study who responded to this pre-existing health conditions question.

3. The Air Pollution Control Board must consider that so far at the local and state level no “site suitability” study and accurate report has been placed in the public record by Dominion for Union Hill CS 2 compressor station. At every phase of the application process, Dominion has been allowed by Buckingham Board of Supervisors, by FERC, and DEQ to perpetuate the myth that BCS is a “sparsely populated” place when it serves them:

- i. to compressor stations 200 miles apart, non-industry standard;
- ii. to have shut off valve distances at 15.7 miles apart at this site, which is not Pipeline Hazard and Safety Administration Agency standards for this population size;
- iii. to allow highest PSIS of pressure at this site;
- iv. to locate the intersection of the existing 4-pipeline Transco corridor with the new ACP pipeline in the middle of a huge wetlands;
- v. where 100% of the drinking water is from that shard aquifer, through individual water wells;
- vi. where A1 agricultural zoning was exempted for heavy toxic polluting new industrials complex;
- vii. where there is no industrial use, yet claimed to be so when ACP and FERC noted “visibility issues” with this complex;
- viii. where there is scarce internet access, yet ACP will build a 125ft. wifi tower and not grant community requests for access to wifi as the only community benefit;

Most egregiously, ACP’s application, the local Board of Supervisors, and DEQ have allowed Dominion to:

- ❖ Erases impacts on a minority community, and its particular and now rare in Virginia historic Freedmen community still living where their ancestors were enslaved;
- ❖ Erased that history in its cultural resource report, **only filed after Advisory Council on Historic Preservation (ACHP) wrote a rare comment of concern** about that complete omission to FERC;
- ❖ Erases need for closer study of the health impacts on this minority community which FERC in its ACP FEIS states would be concerned if BCS were a majority African American community. “ But, FERC stated it is not, using ACP’s census data not the expert data submitted by Dr. Fjord and SELC on actual population;
- ❖ 29.6 persons per square mile allow Dominion to have 75% thinner pipes and up to 500% longer shut off valve distances. For the BCS, FERC FEIS states valve distances are 15.6 miles apart vs. 2 miles for most populated areas. These benefits to the developer at the expense of impacted residents must not go on.

Site Suitability for the BCS, must now be the responsibility of the Air Control Board and the Governor because of the slave plantation legacy in Buckingham.

- ❖ The local Board of Supervisors accepted ACP flawed and incomplete information for the special use permit. Of 91 comments, 87 were against, 4 in favor; Board voted to approve.
- ❖ Deliberate erasure of Buckingham Slave history began in 1869 when vigilantes burnt the courthouse to destroy records of enslavement, fearing Buckingham’s 2:1 majority former slaves’ voting for restitution.
- ❖ In ACP process, African Americans who spoke out against the special use permit have faced reprisals.

DEQ Air and Renewable Energy Director, Mike Dowd, disagreed with FERC’s finding that if Union Hill were populous and a minority community it *would matter* to accepting ACP’s application for BCS site. At the Buckingham air permit public info session, Mr. Dowd stated that “population size” doesn’t matter because all emissions are below EPA standards in this draft air permit. DEQ staff reported having worked hard to research and insist on technology changes to fix this “only time DEQ failed an air permit by a developer,” according to Mr. Dowd.

We are all in this together. Yet this process is not inclusive, nor comprehensive. I ask you to consider where is your moral compass pointing? Please don’t hold Dominion’s hand, taking us all to the edge of extinction. Just say no to this permit, because you can,

because ethical, credible economics and science mandates that you do. Thank you for saving us from ourselves.

Heidi Dhivya Berthoud

Secretary Friends of Buckingham

info@friendsofbuckinghamva.org

<http://www.friendsofbuckinghamva.org/>

<https://www.facebook.com/ProtectBuckingham>

Cell 434 979 9732



Air Division 1, rr <airdivision1@deq.virginia.gov>

BCS air permit comments

1 message

Heidi <heidi1008@gmail.com>

Fri, Sep 21, 2018 at 4:04 PM

To: "Air Division 1, rr" <airdivision1@deq.virginia.gov>

Mike Dowd tells me the email i am using above might be problematic, but it looks like the same one he sent me. Would you please respond to let me know you got this? Thanks.

Heidi Dhivya Berthoud

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Cell 434 979 9732

**Comments BCS air permit HDB 9-21-18.pdf**

738K

Air permit comments about the proposed Buckingham Compressor Station

Heidi Dhivya Berthoud 9-21-2018

heidi1008@gmail.com

434 979 9732

366 Wyland Rd

Buckingham VA 23921

Our home is high on a bluff overlooking the James River and out towards the Blue Ridge. As I write, I sit on our southwest deck, my 3 season outdoor office, with my 3 feline assistants, who inspire deep purpose in all that I do. We are about 6 miles from the proposed BCS, and about 1 mile downstream from the proposed HDD crossing; the HDD would be just upstream from Yogaville. I am part of the Yogaville Community. I enjoy the quiet and clean air of my country abode with my husband, 3 cats and wildlife. I speak for my family, and also as a member of Friends of Buckingham.

DEQ and Dominion assure us this compressor station would be the best in class, meeting all regulations. We like our air and water clean and we don't want the tons of pollutants dumped on us that the 'regulations' say are okay.

We ask for a 30-day extension of the comment period.

Please deny this permit and immediately delay until the issues below are properly addressed.

At the air permit public hearing at Buckingham Middle School on 9/11/18 we came to understand from Attorney David Neal's comments [Southern Environmental Law Center - SELC] that the SAPCB has extended capacities and obligations beyond the DEQ air department's narrow scope of technical evaluation of the compressor station. This is also beyond the scope of the SWCB. Thus SAPCB has a hefty and wider scope of responsibility to which I now appeal.

It is the responsibility of the Air Pollution Control Board to consider:

"2010 Code of Virginia, Title 10.1 - CONSERVATION. Chapter 13 - Air Pollution Control Board (10.1-1300 thru 10.1-1328) § 10.1-1307. Further powers and duties of Board.

E. The Board in making regulations and in approving variances, control programs, or permits, and the courts in granting injunctive relief under the provisions of this chapter, **shall consider** facts and circumstances relevant to the reasonableness of the activity involved and the regulations proposed to control it, including:

1. The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused;
2. The social and economic value of the activity involved;
3. The suitability of the activity to the area in which it is located;"

I will address this statute's 3 sections below.

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Dominion repeatedly asserts that safety is their first priority, to us, to their stockholders, in their green-washed advertising. For 4 years now we have asked for, and have yet to see evacuation plans. I appeal to the SAPCB to not allow approval of an air permit without considering health and safety first – it appears to be your number one directive. Worst-case scenarios must be addressed. The Red Cross could easily help figure things out, and they are motivated; even if our elected officials are not. We don't want anyone to live near a high pressure 57,000+ hp compressor station, which is highly explosive [methane is not only highly explosive, it is also 86 x more of a green house gas & ozone destroyer than CO2 Scientific American, December 2015 <https://www.scientificamerican.com/article/how-bad-of-a-greenhouse-gas-is-methane/%5D>, highly toxic, and an easy terrorist target.

If this permit is granted, it will allow the ACP to move forward. Knowing that consequence, you have the obligation to look at the larger degree of injury to all of us. The combined effects of gHg emissions of both the ACP and MVP have been equilibrated to an additional 46 coal burning plants and 25 million cars. See the reporting of Oil Change International: [New analysis: Mountain Valley and Atlantic Coast Pipelines are Climate Disasters](http://priceofoil.org/2017/02/15/new-analysis-mountain-valley-and-atlantic-coast-pipelines-are-climate-disasters/), Feb, 2017, <http://priceofoil.org/2017/02/15/new-analysis-mountain-valley-and-atlantic-coast-pipelines-are-climate-disasters/>. This does not move us forward, but instead contributes disastrously to the urgent climate crisis.

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I am the secretary for Friends of Buckingham [FoB], but as is the case in volunteer grassroots organizations, I am also the Baseline Testing Project Manager. At the VEJC/DEQ meeting on 9/20/18, the DEQ expressed great interest in the baseline testing that we are doing. We have asked that:

Prior to permitting, the DEQ must require and complete a Quantified Risk Assessment (QRA) and work with other state agencies to conduct a Health Risk Assessment (HRA) and a Health Impact Assessment (HRI). This would counter the compartmentalization of hazards to water from hazards to air, from safety, environmental justice, health impacts from each different 'class' of toxic pollutants and emissions and site suitability.

As Baseline Testing Project Manager for FoB, I went to the local, then regional health departments to ask for assessments. They sent me on to you, the DEQ, who also said no. We were left to defend for ourselves. Thus we did the right thing, taking up the huge project of testing 30 well water sites close to the 26 miles of proposed ACP in Buckingham. We have done air monitoring for PM, VOC's, formaldehyde and H2S, in 8 homes around the compressor station site and are in process with health surveys. We are

also monitoring the 36 streams crossings by the ACP, including 7 flood plains, which is part of the collaborative Pipeline CSI program mentioned above.

This testing should be a standard requirement for any potentially polluting industry. But for this to be a regulatory requirement, would be an admission of the dangers. I also understand that these projects are very costly. We have written and received grants for this project for a mere \$40,000, but its all volunteer labor doing the legwork. I agreed to send links to our website, which we have the intention of sharing with all who are working to protect their air, water, land, health.

<http://www.friendsofbuckinghamva.org/friends/baseline-testing-for-well-water/>

<http://www.friendsofbuckinghamva.org/friends/baseline-testing-a-compilation-of-resources/>

This is the program FoB is following: **Citizen Science Toolkit**, http://www.friendsofbuckinghamva.org/friends/wp-content/uploads/2017/04/SWEHPCitizen_Science_Toolkit.pdf, created by **Southwest Pennsylvania Environmental Health Project [SWPA-EHP]**, <https://www.environmentalhealthproject.org/>. This toolkit was just recently created in 2018 for communities afflicted by oil and gas development.

We consulted extensively with Eric Faisst, Director of the Madison County Health Department, who shepherded the only public comprehensive baseline testing project on the planet, which was a harmonic convergence of many unusual circumstances, not the least important, is that Eric's background is in environmental health, and that 2 members of the Madison County Board of Supervisors requested it [Buckingham Supervisors sold us out, laid out the red carpet for Dominion who has been essentially bribing the community for years. There were 87 comments against the SUP for the BCS, 4 in favor]. Eric collaborated with SWPA-EHP. He has offered to confer with Virginia State government on the work he is doing. Please take him up on it. Let me know if I can cheerlead that process by directing me to the most effective department.

Madison County (NY) Health Department Baseline Community Environmental Monitoring Results. **Madison Cty, NY, Dept Health – compressor station testing**, <http://www.friendsofbuckinghamva.org/friends/wp-content/uploads/2017/04/1Madison-Cty-NY-Dept-Health-compressor-station-testing.pdf>, for a 36-page report including well, surface waters, air, noise.

II. The social and economic value of the activity involved. The owners of Transco Pipeline have said there are enough pipelines in place to meet demand. THESE PIPELINES ARE NOT NEEDED. It is well known that renewables are far more economical than fossil fuels, nuclear.

SAPCB, I urge you to weigh in on this essential issue that seems to be first and foremost concern of many who may not be convinced [uneducated] about the environmental,

environmental justice, safety and health risks, which all have their costs, which are not even factored into the costs, as the industry would not bear them, the ratepayers would.

Unnecessary high capacity natural gas pipelines are being built across our nation. Investors will continue to build pipelines as long as there is an outdated federal policy guaranteeing at least a 14% rate of return with no risk.

Economy:

- On average [only 54% of existing natural gas pipeline infrastructure](https://www.nrdc.org/experts/amy-mall/natural-gas-industry-admits-new-pipelines-arent-needed) is being used
<https://www.nrdc.org/experts/amy-mall/natural-gas-industry-admits-new-pipelines-arent-needed>
- CEO & President of the South Carolina Small Business Chamber of Commerce, Frank Knapp, [warned that Dominion Energy was misleading the public at a press conference, https://scsbc.org/about/president-and-ceo-frank-knapp/](https://scsbc.org/about/president-and-ceo-frank-knapp/). He also said Virginia was paying for a pipeline they didn't need
- Cost of the new pipelines will make energy costs rise by 30% or more
- Higher energy costs will strain businesses and put jobs at risk
- [Renewables are on track to produce energy cheaper than fossil fuels, https://www.forbes.com/sites/dominicdudley/2018/01/13/renewable-energy-cost-effective-fossil-fuels-2020/-2049127d4ff2](https://www.forbes.com/sites/dominicdudley/2018/01/13/renewable-energy-cost-effective-fossil-fuels-2020/-2049127d4ff2)
- [Tesla Giant Powerpack Battery reduced energy costs by 90% in Australia, https://electrek.co/2018/05/11/tesla-giant-battery-australia-reduced-grid-service-cost/](https://electrek.co/2018/05/11/tesla-giant-battery-australia-reduced-grid-service-cost/)

Three excellent papers on the economics of these pipelines at FoB site:
<http://www.friendsofbuckinghamva.org/friends/economics-of-the-pipelines-3-papers-by-tom-hadwin/>

To Understand Pipeline Economics Follow the Money
Excerpts from Comments to the SCC_Aug17-2018
[Hadwin-Comments_Air-Quality-Permit-Buckingham-Compressor-Station](#)

The above articles are authored by Thomas Hadwin. Mr. Hadwin worked in electric and gas utilities in Michigan and New York. He led a multi-disciplinary team responsible for siting and gaining regulatory approval of multi-billion dollar projects. The group was also responsible for assuring that company facilities complied with state and federal environmental regulations.

He also served as a tech entrepreneur, national business consultant and educator.

You can also go to this site for more articles, which is produced by the [Friends of the Central Shenandoah Valley](http://www.censhen.org/), <http://www.censhen.org/>. Contact: tomh@censhen.org

III. The suitability of the activity to the area in which it is located

Excerpts from 2 papers by Lakshmi Fjord, PhD on FoB website.

FoB Critical Questions BCS Air Permit 9-18-18

<http://www.friendsofbuckinghamva.org/friends/wp-content/uploads/2018/09/FoB-Critical-Questions-BCS-Air-Permit-9-18-18.pdf>

UH Household Study Stats Sheet 9-18 9-18

<http://www.friendsofbuckinghamva.org/friends/wp-content/uploads/2018/09/UH-Household-Study-Stats-Sheet-9-18-9-18.pdf>

Unsuitability of Union Hill, Buckingham VA as only ACP Virginia compressor station site

Dominion has consistently used misinformation about the factual population, race, and omission of historic cultural resources in submissions to Buckingham elected representatives, to FERC and DEQ. Misinformation that erases the name of the community, denser populated numbers of people living in close proximity, majority African American race, and erasure of their Former Slave and Freedmen history (as well as former plantation history) has shaped decision-making at every level of ACP's permit processes.

1. Dominion unfairly singled out Buckingham County from all counties along the three state route of ACP to claim it has “no historic resources” whether archaeological or architectural in that segment. Yet in all other counties, completely similar resources of early and mid-20th Century and 19th Century homes, churches and their cemeteries, bridges, dilapidated farm structures and stores, etc. were listed and photographed for 1674 pages. Alone, Buckingham's history was/is denied and erased.

❖ In Sept. 18, 2016 ACP filed a 1674 page cultural resource application to FERC. For Buckingham County only, ACP had “no recorded resources identified within the modified project APE” (Appendix D: 31).

❖ In March 24, 2016, ACP filed their Addendum of cultural resources. In Appendix D on P. 31, for Buckingham ACP reports only “three [total] resources are “documented within the modified project APE include three single-family dwellings that range in date from circa 1940 to circa 1965 . . . They have no known association with a significant event or person and are not associated with any broad patterns in history.”

Pp. 330, 331, and 332 are photos of that list of homes/addresses: 330 & 331 **are the same home/same photo. 332 is not in Union Hill.** L. Fjord identifies 330/331 – the only cultural resources listed for the whole county of Buckingham - as Theo Haskins' on S. James River Highway, an abandoned trailer next to a modular home, without the family cemetery that adjoins it.

- ❖ That is, Dominion’s contractors had to visibly ignore 99 homes on all sides of the CS 2 site, 2 historic black churches and their cemeteries (Union Hill Baptist est 1868; Union Grove Missionary Baptist est. circa 1920); 1 historic white church and cemetery est. 1831, 2 historic black school sites, the 1880s Freedmen home place of the Harper family next to the proposed CS site, no photos of the Variety Shade tobacco barn or of Shelton Store, which is visible from the road in Union Hill.
- ❖ May 3, 2016, “Union Hill/Woods Corner Rural Historic District” Buckingham, VA was listed by Preservation Virginia as a “Most Endangered Historic Place” in Virginia.
Notification of that listing and its complex of historic resources, marked and unmarked slave burials, churches, cemeteries, former plantation sites, farm structures, homes, photographs, and slave plantation neighborhood history have been part of public record of comments made to the Buckingham Planning Commission, the Buckingham Board of Supervisors, to FERC, by Dr. Lakshmi Fjord, Justin Sarafin and Sonja Ingram of Preservation Virginia since August 2016.

2. Dominion knowingly erased the existence of Union Hill as a known community, and its 99

households visibly within 150ft – 1-mile radius on all sides of their ACP VA compressor

station site. In their 2015 FERC application and in all local and state permit processes both written and submitted at public hearings, ACP used the 2010 census average person per square mile data for the whole of Buckingham County – 29.6 – to report the population for ACP CS 2.

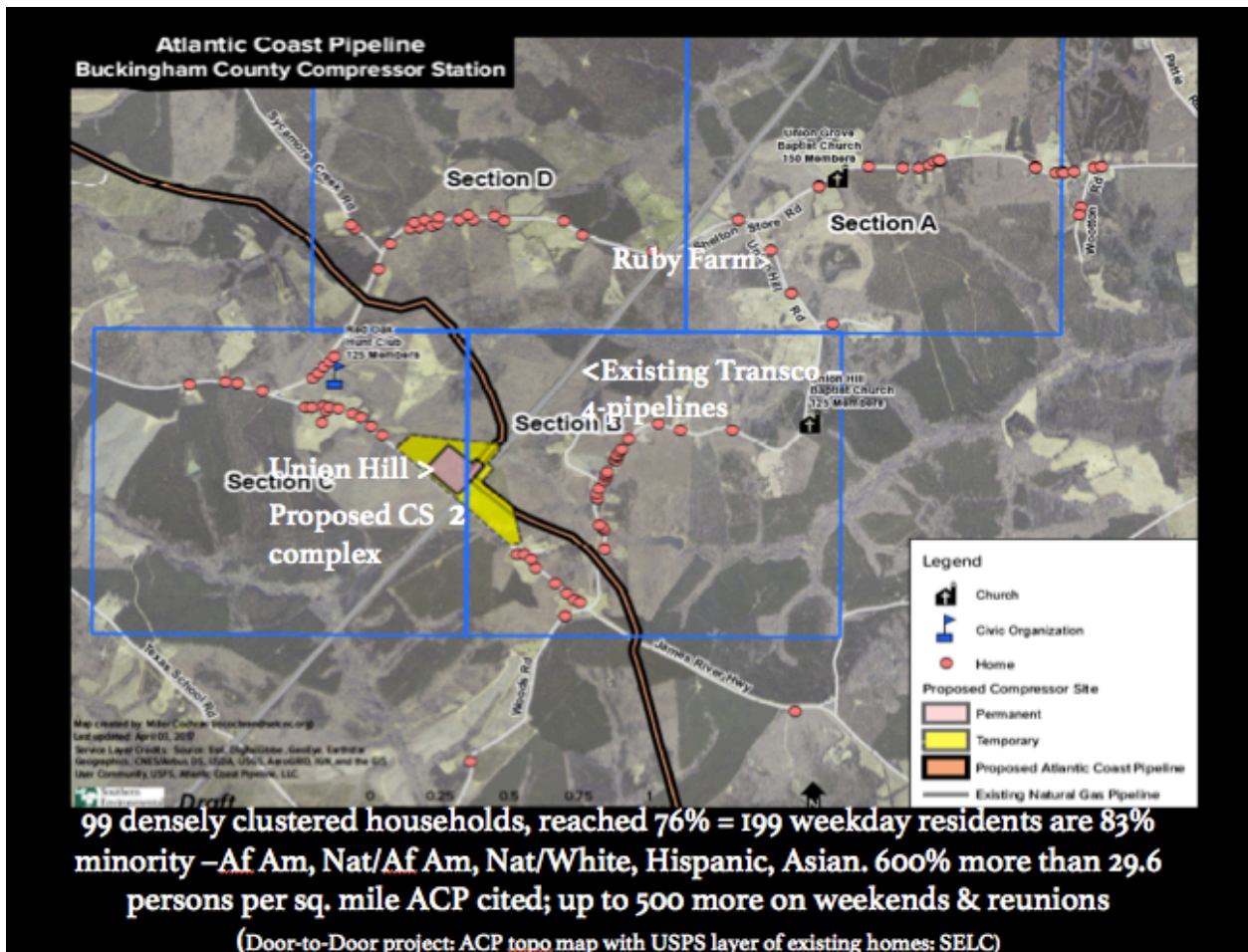
- ❖ On May 30, 2018, the spokeswoman for Dominion to the Governor’s Advisory Council on Environmental Justice claimed “it is the law” to do so -- when National Environmental Protection Act-NEPA guidelines state the opposite is true:

“The fact that census data can only be disaggregated to certain prescribed levels (e.g., census tracts, census blocks) suggests that pockets of minority or low-income communities, including those that may be experiencing disproportionately high and adverse effects, *may be missed in a traditional census tract-based analysis.*” *Caution is called for in using census data due to the possibility of distortion of population breakdowns* ... In addition to identifying the proportion of the population of individual census tracts that are composed of minority individuals, analysts should attempt to identify whether high concentration "pockets" of minority populations are evidenced in specific geographic areas. ... The IWG guidance also advises agencies not to ‘artificially dilute or inflate’ the affected minority population” (1997, 15-16).

- ❖ The Union door-to-door household study of Union Hill designed and conducted by Dr. Lakshmi Fjord (UVa, Dept. of Anthropology) began in August 2016 to uncover the actual 1-mile radius demographic and historic data for the CS 2 site has had 3 stages for a total of 4 months, and ending Sept. 4, 2018. The study follows NIH protocols for health information confidentiality, and community research guidelines. Open-ended interviews of 1-1.5 hours took place in 67 of the 75 households reached. Data includes: factual population, race, ages, pre-existing diagnosed health conditions, family heritage in Union Hill and nearby, and existing economic or food source uses of their land.

ACP's Buckingham CS site map found at dom.com, with a layer of household addresses added by Southern Environmental Law Center based on USPS postal addresses, proves that Dominion always knew and could submit accurately that CS is not "sparsely populated," is not 29.6 people per square mile.

- ❖ There are many cost benefits to Dominion to erase the population of Union Hill. By contravening NEPA guidelines, FERC in ACP's Final Environmental Impact Statement-FEIS reports no environmental justice issues besides low-income for the entire ACP route, which includes Union Hill-sited CS 2 (FEIS 4.9.9.1 Demographic and Economic Data, Vol 4-512). FERC notes their concerns if there were an African American majority population at this site:



“As discussed in section 4.11.1, air pollutants associated with ACP and SHP include increased dust as a result of construction equipment and vehicles, and compressor station emissions, which include carbon monoxide (CO), carbon dioxide (CO₂), methane, and nitrous oxide (NO_x); volatile organic compounds (VOCs); and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns (PM_{2.5}). These air pollutants are known to increase the effects of asthma³¹ and may increase the risk of lung cancer (Nafstad et al., 2003).

Due to high rates of asthma within the overall African American community, we consider this community especially sensitive” (FEIS Vol 4:512)

- ❖ Union Hill household data including revised population, race, and existing diagnostic health conditions, is in the public record to Buckingham elected representatives, 2016-17; to FERC in EIS public comments by Dr. Fjord and by Southern Environmental Law Center (SELC), 2017; by Dr. Fjord in 401 Water permit comments and NW12 Water Board comments, 2017-18.

- ❖ Updated household data (Sept. 3, 2018 updates):
 - 75 of 99 households reached for a 76.5% response rate, an outstanding rate in social science research.
 - 199 weekday residents; with hundreds more on weekends, bimonthly, etc.
 - 83% are minorities: African American, Native American/African American, Native American/White, Hispanic, and Asian
 - 17% are White
 - Children 0-17 are 32%; Elderly are 25%
 - For 67 households, we have listed in the table existing diagnosed health conditions that would be impacted by the combination of emissions applied for at BCS, including particulate matter, radon, volatile organic compounds, and list of EPA emissions DEQ lists in their draft air permit for ACP.
 - Known pre-existing diagnoses at Union Hill, include diabetes, asthma and other lung conditions, chronic bronchitis and pneumonia, heart conditions, breast and other cancers, COPD, lupus, kidney disease, epilepsy, multiple sclerosis, brain tumor, migraines from 35 households in our study who responded to this pre-existing health conditions question.

3. The Air Pollution Control Board must consider that so far at the local and state level no “site suitability” study and accurate report has been placed in the public record by Dominion for Union Hill CS 2 compressor station. At every phase of the application process, Dominion has been allowed by Buckingham Board of Supervisors, by FERC, and DEQ to perpetuate the myth that BCS is a “sparsely populated” place when it serves them:

- i. to compressor stations 200 miles apart, non-industry standard;
- ii. to have shut off valve distances at 15.7 miles apart at this site, which is not Pipeline Hazard and Safety Administration Agency standards for this population size;
- iii. to allow highest PSIS of pressure at this site;
- iv. to locate the intersection of the existing 4-pipeline Transco corridor with the new ACP pipeline in the middle of a huge wetlands;
- v. where 100% of the drinking water is from that shard aquifer, through individual water wells;
- vi. where A1 agricultural zoning was exempted for heavy toxic polluting new industrials complex;
- vii. where there is no industrial use, yet claimed to be so when ACP and FERC noted “visibility issues” with this complex;
- viii. where there is scarce internet access, yet ACP will build a 125ft. wifi tower and not grant community requests for access to wifi as the only community benefit;

Most egregiously, ACP’s application, the local Board of Supervisors, and DEQ have allowed Dominion to:

- ❖ Erases impacts on a minority community, and its particular and now rare in Virginia historic Freedmen community still living where their ancestors were enslaved;
- ❖ Erased that history in its cultural resource report, **only filed after Advisory Council on Historic Preservation (ACHP) wrote a rare comment of concern** about that complete omission to FERC;
- ❖ Erases need for closer study of the health impacts on this minority community which FERC in its ACP FEIS states would be concerned if BCS were a majority African American community. “ But, FERC stated it is not, using ACP’s census data not the expert data submitted by Dr. Fjord and SELC on actual population;
- ❖ 29.6 persons per square mile allow Dominion to have 75% thinner pipes and up to 500% longer shut off valve distances. For the BCS, FERC FEIS states valve distances are 15.6 miles apart vs. 2 miles for most populated areas. These benefits to the developer at the expense of impacted residents must not go on.

Site Suitability for the BCS, must now be the responsibility of the Air Control Board and the Governor because of the slave plantation legacy in Buckingham.

- ❖ The local Board of Supervisors accepted ACP flawed and incomplete information for the special use permit. Of 91 comments, 87 were against, 4 in favor; Board voted to approve.
- ❖ Deliberate erasure of Buckingham Slave history began in 1869 when vigilantes burnt the courthouse to destroy records of enslavement, fearing Buckingham’s 2:1 majority former slaves’ voting for restitution.
- ❖ In ACP process, African Americans who spoke out against the special use permit have faced reprisals.

DEQ Air and Renewable Energy Director, Mike Dowd, disagreed with FERC’s finding that if Union Hill were populous and a minority community it *would matter* to accepting ACP’s application for BCS site. At the Buckingham air permit public info session, Mr. Dowd stated that “population size” doesn’t matter because all emissions are below EPA standards in this draft air permit. DEQ staff reported having worked hard to research and insist on technology changes to fix this “only time DEQ failed an air permit by a developer,” according to Mr. Dowd.

We are all in this together. Yet this process is not inclusive, nor comprehensive. I ask you to consider where is your moral compass pointing? Please don’t hold Dominion’s hand, taking us all to the edge of extinction. Just say no to this permit, because you can,

because ethical, credible economics and science mandates that you do. Thank you for saving us from ourselves.

Heidi Dhivya Berthoud

Secretary Friends of Buckingham

info@friendsofbuckinghamva.org

<http://www.friendsofbuckinghamva.org/>

<https://www.facebook.com/ProtectBuckingham>

Cell 434 979 9732



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Johnnie Bishop <Johnnie.Bishop.126028371@p2a.co>

Fri, Sep 21, 2018 at 4:23 PM

Reply-To: jbishop112842@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Johnnie Bishop
[53 Farmington Dr](#)
[Staunton, VA 24401](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Joseph Blizman <Joseph.Blizman.107620455@p2a.co>

Fri, Sep 21, 2018 at 4:19 PM

Reply-To: joseph.blizman@dominionenergy.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Joseph Blizman
[7255 Chime Ct](#)
[Mechanicsville, VA 23111](#)

Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Deborah Blizman <Deborah.Blizman.107620455@p2a.co>

Fri, Sep 21, 2018 at 4:30 PM

Reply-To: dablizman@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Deborah Blizman
[7255 Chime Ct](#)
[Mechanicsville, VA 23111](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Martha Boneta <Martha.Boneta.125598424@p2a.co>

Fri, Sep 21, 2018 at 4:21 PM

Reply-To: martha@marthaboneta.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Martha Boneta
[2628 Five Oaks Rd](#)
[Vienna, VA 22181](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP is safe and necessary

1 message

Martha Boneta <Martha.Boneta.125598424@p2a.co>

Fri, Sep 21, 2018 at 4:21 PM

Reply-To: martha@marthaboneta.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

Doing the right thing for our communities, our economy, and our environment is a balancing act. That's why a project as important as the Atlantic Coast Pipeline isn't built overnight. Rather, this project has gone through more than three years of careful planning and thorough scrutiny from agencies and organizations at every level.

Because of that exhaustive planning, the ACP is the safest way for us to get affordable, cleaner natural gas to those in our region who desperately need it.

The Buckingham Compressor Station is an integral part of the ACP project. The compressor station's "best in class" engineering design, and advanced emissions control equipment will ensure the facility will fully protect Virginia's air quality. In fact, modeling has demonstrated that the station's emissions, even when the facility is operating at its maximum, will not adversely impact Virginia's air quality. The modeling was conducted using methods approved by DEQ and has proven reliable thus far.

I believe that the stringency of the air quality permit that the ACP project has already passed will keep our community safe—while still allowing us to move forward with producing cleaner and more affordable American energy.

Accordingly, in the case of the recent discussions by the State Water Control Board regarding the state's use of the Army Corps of Engineers Nationwide Permit 12, I believe revisiting the existing process would be a mistake.

Our state's environment and our business climate have prospered from a consistent, predictable regulatory climate and from federal and state partnerships to allow scarce regulatory resources to be put to optimal use. There is no need to change the current approach.

Sincerely,
Martha Boneta
[2628 Five Oaks Rd](#)
[Vienna, VA 22181](#)

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Deny the Buckingham Compressor Station air permit

1 message

Henri Bowman <henribowman@gmail.com>

Fri, Sep 21, 2018 at 7:12 PM

Reply-To: henribowman@gmail.com

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

I respectfully urge you to deny the draft minor source air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station.

This compressor station poses a direct threat to our climate, our air quality, and - most importantly - to the lives of the historic freedman and largely African American Union Hill community. If built, the compressor station would emit methane, nitrogen oxides, volatile organic compounds and particulate matter into the air in close range to community members' homes and would be a stark example of environmental racism at play in the Commonwealth.

We ask that you deny this permit and request that the following concerns be addressed:

- DEQ and the Air Board must ensure that the permit for the Buckingham Compressor Station does not disproportionately impact marginalized communities. However, the vast majority of residents in close proximity to the proposed compressor station site - 85% - are people of color, and a large proportion are elderly or very young. Therefore, a disproportionate impact on an environmental justice community is virtually guaranteed. If the project cannot be modified to avoid this outcome, the air permit should be denied.
- ACP has not shown that the amount of toxic air emissions from the compressor will not cause or contribute to the endangerment of human health. DEQ should conduct a baseline Health Impact Assessment to better understand what ailments already exist in the community that could be exacerbated by these emissions. The elderly, very young, and community members who already have respiratory health issues are particularly at risk.
- DEQ should require ACP to continuously monitor nitrogen oxide emissions to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ should conduct further analysis of the greenhouse gas emissions associated with this proposed compressor station. While Virginia is poised to begin regulating carbon dioxide emissions from electric power plants, ignoring the greenhouse gas emissions from the infrastructure used to supply those power plants is self-defeating. With each new pipeline and compressor station built, significant amounts of methane are emitted into the atmosphere, exacerbating climate change impacts. Though methane does not last in the atmosphere nearly as long as carbon dioxide, methane is much more efficient at capturing radiation than carbon dioxide and, pound for pound, the comparative impacts of methane to carbon dioxide are 25 times greater over a 100 year period. Greenhouse gas emissions are mentioned in the draft air permit, but further analysis of impacts and plans to mitigate those emissions are necessary.
- ACP has not adequately addressed emergency response plans. Detailed plans should be drafted and shared with the community. These plans should outline evacuation and actions in response to an explosion or other emergency at the Buckingham compressor station. At this time, there is no certainty that residents could be evacuated promptly, and Buckingham County emergency responders do not have the supplies or resources to respond to a significant industrial emergency.

It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station. I urge you to deny the permit.

Sincerely,

Henri Bowman
934 Trout St
Staunton, VA 24401
4349607515



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Gregory Boyce <Gregory.Boyce.107643036@p2a.co>

Fri, Sep 21, 2018 at 4:23 PM

Reply-To: gregory.boyce@dominionenergy.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Gregory Boyce
[202 Midship Ct](#)
[Chesapeake, VA 23323](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP is safe and necessary

1 message

Kevin Broad <Kevin.Broad.12812402@p2a.co>

Fri, Sep 21, 2018 at 4:21 PM

Reply-To: harleyridernut@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

Doing the right thing for our communities, our economy, and our environment is a balancing act. That's why a project as important as the Atlantic Coast Pipeline isn't built overnight. Rather, this project has gone through more than three years of careful planning and thorough scrutiny from agencies and organizations at every level.

Because of that exhaustive planning, the ACP is the safest way for us to get affordable, cleaner natural gas to those in our region who desperately need it.

The Buckingham Compressor Station is an integral part of the ACP project. The compressor station's "best in class" engineering design, and advanced emissions control equipment will ensure the facility will fully protect Virginia's air quality. In fact, modeling has demonstrated that the station's emissions, even when the facility is operating at its maximum, will not adversely impact Virginia's air quality. The modeling was conducted using methods approved by DEQ and has proven reliable thus far.

I believe that the stringency of the air quality permit that the ACP project has already passed will keep our community safe—while still allowing us to move forward with producing cleaner and more affordable American energy.

Accordingly, in the case of the recent discussions by the State Water Control Board regarding the state's use of the Army Corps of Engineers Nationwide Permit 12, I believe revisiting the existing process would be a mistake.

Our state's environment and our business climate have prospered from a consistent, predictable regulatory climate and from federal and state partnerships to allow scarce regulatory resources to be put to optimal use. There is no need to change the current approach.

Sincerely,
Kevin Broad
[341 Norfolk Ave](#)
[Lynchburg, VA 24503](#)

--



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Kevin Broad <Kevin.Broad.12812402@p2a.co>

Fri, Sep 21, 2018 at 4:20 PM

Reply-To: harleyridernut@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a "minor" source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to "minor" sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Kevin Broad
[341 Norfolk Ave](#)
[Lynchburg, VA 24503](#)

Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Megan Brockwell <Megan.Brockwell.112297062@p2a.co>

Fri, Sep 21, 2018 at 6:21 PM

Reply-To: megan_brockwell@hotmail.comTo: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Megan Brockwell
[17154 Sanddollar Ln](#)
[Dinwiddie, VA 23841](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Public Comment for Buckingham Compressor Station for the Atlantic Coast Pipeline Air Quality Permit

1 message

Thomas Burkett <tomburkett@gmail.com>

Fri, Sep 21, 2018 at 11:54 PM

To: airdivision1@deq.virginia.gov, michael.dowd@deq.virginia.gov, patrick.corbett@deq.virginia.gov

Please consider the following in regard to the Buckingham Compressor Station for the Atlantic Coast Pipeline Air Quality Permit.

- The Atlantic Coast Pipeline (ACP) is not needed to supply energy to the areas Dominion claims would be served and
- DEQ has failed to properly consider whether the placement of the facility is appropriate or to acknowledge the violation of environmental justice principles.
- **1] First and foremost**, I'm asking for a 30 day extension of the comment period [update: the 11 days extension is not enough].

2] Second important request: The Department of Environmental Quality should immediately complete a Quantified Risk Assessment (QRA) for the Buckingham Compressor Station prior to permitting and to work with other state agencies to conduct a Health Risk Assessment (HRA) and a Health Impact Assessment (HRI).

DEQ officials have stated that the Department and the Board lack authority to consider issues related to the need for the project and proper siting of the station. State law explicitly contradicts this position. The State of Virginia not only has that authority, it has a solemn obligation to exercise it.

The Air Board, in approving permits, "shall consider facts and circumstances relevant to the reasonableness of the activity involved," including: [from Code of Virginia § 10.1-1307.E.]

1. The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused;
2. The social and economic value of the activity involved;
3. The suitability of the activity to the area in which it is located; and
4. The scientific and economic practicality of reducing or eliminating the discharge resulting from such activity.

Reasons to deny the permit:

No Need for the Pipeline and Compressor Station

A mountain of evidence proves that Dominion's claims about the need for gas to be supplied by ACP are untrue. Importantly for this permit review, DEQ has refused to acknowledge this information or to incorporate it into its analysis of Dominion's application for the air permit.

This deficiency is directly pertinent to the "reasonableness of the activity involved" and the "social and economic value of the activity involved," which the Air Board must consider. Code of Virginia § 10.1-1307.E. Weighing against the lack of need for the project are the social and economic costs that will be imposed on the communities directly affected by the compressor station.

Unfair Targeting of Communities of Color and Impacts to Vulnerable Populations

The disproportionate impacts the compressor station would have on the African American community in and around Union Hill are clearly shown. The Federal Energy Regulatory Commission (FERC) relied on incorrect and incomplete information about the local community to dismiss environmental justice and siting concerns. The Air Board must demand

that DEQ provide and analyze correct data on these issues and must reject this permit unless and until the Department does so.

The Air Board is required to consider these facts in an analysis of the “character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused” and the “suitability of the activity to the area in which it is located.” Code of Virginia § 10.1-1307.E. The Board must reject the draft permit prepared by DEQ and require that all pertinent siting considerations be investigated and analyzed before it considers the proposal further.

FERC relied on incorrect data from Dominion to conclude in its final environmental impact statement on the ACP that, on average, there are 29.6 people per square mile in the area surrounding the pipeline’s path in Buckingham—that number was provided by the U.S. Census Bureau. However, a survey of the community by Friends of Buckingham showed that FERC’s number was off by about 500 percent.

Even worse, FERC failed to acknowledge the certain impacts to the Union Hill community. As reported in a news article at [Cville.com](#), *Compressor anxiety: Historic African American community alleges environmental racism*:

“Members of the anti-pipeline group Friends of Buckingham went door-to-door to survey the Union Hill area. They spoke with 64 percent of the people living in the 99 households within that square mile, and of those 158 residents, 85 percent are African American.”

“The FERC report didn’t mention Union Hill, where a third of the residents are descendants of the freedmen community that was once enslaved there, and where there are freedmen cemeteries and unmarked slave burials on the site where Dominion wants to build its compressor station, according to Yogaville resident and cultural anthropologist Lakshmi Fjord.”

DEQ has also failed to account for the fact that these areas have unusually large percentages of elderly people and children, both of which are especially sensitive to the kinds of air pollutants the compressor station would emit.

Recently, Governor Northam’s Advisory Council on Environmental Justice (ACEJ) found evidence that ACP would have “disproportionate impacts for people of color and for low-income populations due to gas infrastructure expansion.”

Based on that and other findings, the ACEJ recommended the “Governor direct DEQ to suspend the permitting decision for the air permit for the Buckingham compressor station pending further review of the station’s impacts on the health and the quality of life of those living in close proximity.” See ACEJ letter, dated August 16, 2018, at [Environmental Justice Review of Virginia’s Gas Infrastructure](#). The ACEJ also recommended Governor Northam convene an Emergency Task Force on Environmental Justice in Gas Infrastructure. See article about the ACEJ’s action at [Governor’s Advisory Council Call for Moratorium on Atlantic Coast and Mountain Valley Pipelines](#), Global Justice Ecology Project, August 29, 2018.



Air Division 1, rr <airdivision1@deq.virginia.gov>

Re: Public Comment for Buckingham Compressor Station for the Atlantic Coast Pipeline Air Quality Permit

1 message

Thomas Burkett <tomburkett@gmail.com>

Fri, Sep 21, 2018 at 11:58 PM

To: airdivision1@deq.virginia.gov, michael.dowd@deq.virginia.gov, patrick.corbett@deq.virginia.gov

Please watch and consider the following videos and deny the Buckingham Compressor Station for the Atlantic Coast Pipeline Air Quality Permit. These videos are to be taken as my public comment.

<https://vimeo.com/272548843>

<https://vimeo.com/185173563>

Tom Burkett

On Sep 21, 2018, at 11:54 PM, Thomas Burkett <tomburkett@gmail.com> wrote:

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The Air Board is required to consider these facts in an analysis of the “character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused” and the “suitability of the activity to the area in which it is located.” Code of Virginia § 10.1-1307.E. The Board must reject the draft permit prepared by DEQ and require that all pertinent siting considerations be investigated and analyzed before it considers the proposal further.

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“The FERC report didn’t mention Union Hill, where a third of the residents are descendants of the freedmen community that was once enslaved there, and where there are freedmen cemeteries and unmarked slave burials on the site where Dominion wants to build its compressor station, according to Yogaville resident and cultural anthropologist Lakshmi Fjord.”

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Air Division 1, rr <airdivision1@deq.virginia.gov>

Fwd: Compressor Station Air Permit

1 message

gulliver_eeb@yahoo.com <gulliver_eeb@yahoo.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 11:41 PM

I am Erin Burnette and I own land and a home in Buckingham County. Though not immediately adjacent to the Compressor station, our air will be contaminated with discharges of health degrading emissions from the compressor station if it is approved. This permit needs a true evaluation of health impacts if it is to be effective. You must conduct health risk, quantified risk and health impact assessments to insure that our air quality will be protected if this compressor station is built. You should also extend the comment period for at least 30 more days since Dominion had years to draft the permit and citizens are only given a token time period in which to try to defend their lives.

I have both a Master of Divinity and Master of Social Work degrees. This compressor station represents a textbook example of a violation of environmental justice as it is slated to be built in the historically significant and predominately African American neighborhood of Union Hill. The permit does not insure that this community, nor the larger population of Buckingham County will have acceptable air quality if the compressor station is built. Also, the SUP granted by the Buckingham Board of Supervisors is in legal limbo as the courts have yet to rule on its validity. Why grant an air permit to a facility with questionable legal validity? I agree with all of the comments submitted by the Sierra Club, the Chesapeake Climate Action Network, SELC, Wild Virginia, and Suzanne Keller, epidemiologist.

Best,
Erin Burnette, [1226 Stanhope Avenue, Richmond VA 23227](#)
gulliver_eeb@yahoo.com

Sent from [Outlook](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Air Permit - Buckingham Compressor Station -

1 message

Karen Campblin <karen@ktcpplan.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 5:17 PM

Attached please find comments regarding the Buckingham Compressor Station Air Permit submitted by the Buckingham County NAACP and the VSC NAACP.

If you have any questions or require additional information, please contact

Karen Campblin
VSC NAACP
Environmental and Climate Justice Committee, Chair
ktc1426@gmail.com
407.496.1273

Thank you
Karen

**VSC NAACP_BuckinghamCompressorAirPermit_Comments_September21_2018.pdf**
101K



Virginia State Conference NAACP

1214 W. Graham Road, Richmond, VA 22220

Phone: 1-804-321-5678

By Electronic Mail

September 21, 2018

Mr. David Paylor
Director
Virginia Department of Environmental Quality
P.O. Box 1105
Richmond, Virginia 23218

Re: Buckingham Compressor Station- Air Permit

On behalf of the Buckingham County NAACP and the Virginia State Conference NAACP, we are writing to express our opposition to the granting of an air permit for the Atlantic Coast Pipeline Compressor Station in Buckingham County, Virginia. Our opposition is based on the following:

1. The demographic and cultural and historic data used by the applicant is not accurate.
2. The air modeling used by the applicant is not adequate.
3. There has not been a qualitative risk assessment and comprehensive Health Impact assessment completed by the applicant.

Furthermore, we also request the comment period be extended for no less than 60 days.

1 - We ask that all activities associated with constructing the pipelines are halted until accurate demographic, cultural and historic data are submitted by the applicant. Furthermore, we ask that the applicant work collaboratively with all local residents and property owners to make sure the community's intrinsic resources are included, particularly those with significant historic and cultural value (i.e. unmarked gravesites).

Federal and state laws mandate data used to determine the feasibility and safety of any project, particularly one that poses significant adverse impacts, should accurately reflect the composition and character of the surrounding community. However, the data submitted by the applicant does not.

The portion of Union Hill which was omitted from the application submitted to the Federal Energy Regulatory Commission (FERC), is predominately African-American and consists of approximately 99 unreported homes, and several historic sites; including 2 historic black churches and cemeteries. Established by freed enslaved families after the Civil War, the Union Hill/Woods Corner Rural Historic District, was listed as a "Most Endangered Historic Place in Virginia" by Preservation VA in 2016.

Since the applicant did not accurately list the actual population living within close proximity to the compressor station site, the undercount allows the applicant to avoid adhering to federal and state mandated regulations used to identify and prevent disproportionate adverse impacts to minority and elderly populations. In addition, the low population count allows the applicant to implement substandard

safety protocols, such as to: use fewer heavy pipes, place longer shutoff valve distances, operate the station 24 hours a day/7 days a week unmanned, and not be required to use odorant to help alert the surrounding community in case of a leak, to name a few.

2 – We ask that the applicant be required to use a more robust and reliable air modeling and air quality monitoring program.

According to “Fumes Across the Fence-Line, a report jointly written by NAACP and CleanAIR Task Force, “the racial disparities among communities impacted by environmental pollution in the United States is stark. African Americans are exposed to 38% more polluted air than Caucasian Americans, and they are 75% more likely to live in fence-line communities than the average American. The report defines fence-line communities as “communities that are next to a company, industrial, or service facility and are directly affected in the facility’s operation (e.g. noise, odor, traffic, and chemical emissions”.

The proposed compressor station, the largest to be built in the Commonwealth of Virginia, will be constructed within a few hundred feet of existing homes (unreported dwellings as discussed in #1), and is expected to pump hazardous air pollutants and particulate into the environment. Leakages are known to be an unpreventable part of the normal operations of any compressor station. However, due to the inaccurate population count, the applicant does not need to have, nor do they intend to implement, stringent protocols to monitor/combat potential leaks that could cause air quality degradation or pose immediate risk to the community and environment as would have been required with higher population counts.

The applicant must be required to use industry-proven technology that considers real-life characteristics (i.e. surrounding land uses, local topography, seasonal climatic changes, wind patterns etc.) to develop a robust baseline as well as, procedures to conduct consistent air quality testing.

3 - Completion of a Quantitative Risk Assessment and Comprehensive Health Impact Assessment to properly assess, evaluate and mitigate potential negative effects.

In May 2018, the VSC NAACP submitted comments to the DEQ to halt all construction activities associated with the pipeline until a comprehensive stream-by-stream analysis is conducted, and that a study of the cumulative effect the pipeline will have on our surface water bodies is performed. We continue to be committed to encouraging all efforts to include cumulative analysis for this project. Studies and personal interviews conducted by grassroots efforts revealed the Union Hill community’s residents experience existing medical conditions including asthma, and other illnesses that will be worsen by increased exposure to air pollutants and particulate matters emitted from the station.

Again, we implore you to deny the air permit for the compressor station in Buckingham County.

Thank you for your consideration.

Sincerely,

Kevin Chandler

Rev. Kevin Chandler
VSC NAACP
President

Karen Campblin

Karen Campblin
VSC NAACP
Environmental Climate Justice Committee,
Chair



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Gregory Caple <Gregory.Caple.107855996@p2a.co>

Fri, Sep 21, 2018 at 4:21 PM

Reply-To: s11gcaple@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Gregory Caple
[2222 E Cary St](#)
[Richmond, VA 23223](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Air Compressor Station

1 message

Freeda Cathcart <contactfreeda@gmail.com>
To: airdivision1@deq.virginia.gov

Sat, Sep 22, 2018 at 12:59 AM

Please forward to the State Air Board:

Please extend the public comment period. There has not been enough time for people to be able to process all the technical information about this massive project. So far this looks like an unprecedented project that could have harmful effects that we can't imagine.

It's irresponsible to proceed approving this compressor when there's no market demand for the gas. The ACP project should be paused until there is more research on how to do it safely and IF there is a need for the project. Due to energy efficiency and renewable energy there is more than enough capacity to meet the demand for gas.

If there seems to be a need for the project then the Department of Environmental Quality must complete a Quantified Risk Assessment (QRA) for the Buckingham Compressor Station prior to permitting and to work with other state agencies to conduct a Health Risk Assessment (HRA) and a Health Impact Assessment (HRI).

Thank you for your service to our Commonwealth,
Freeda Cathcart

--

540-598-7231



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station Comments

1 message

David Christian <david.christian@dominionenergy.com>
To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 3:14 PM

Virginia Department of Environmental Quality
Piedmont Regional Office
[4949-A Cox Road](#)
[Glen Allen, VA 23060](#)

RE: Buckingham Compressor Station

Dear Department of Environmental Quality:

Thank you for the opportunity to offer my comments on the draft air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station. As a resident of the Commonwealth, I have strongly backed the pipeline and believe it is one of the foundations of a more secure and reliable energy future for Virginia. However, I could not support the project if I believed that the pipeline or any of its associated facilities, including the compressor station, would harm our state's environment. Fortunately I have no such concerns. I am confident in the project developers' commitment to protecting our natural resources and I am equally confident in DEQ's ability to oversee and regulate the ACP's environmental aspects. Your draft air quality permit for the Buckingham Compressor Station provides me with even more confidence in the project.

I am very impressed by the emissions limits and control technology incorporated in the draft permit. Although the station is classified as a "minor" source, the permit requirements are similar to those typically imposed on facilities with much higher levels of emissions. In fact, I understand that the limits imposed by the draft permit are four to 10 times more stringent than the limits in other recently issued for compressor stations in the Commonwealth. This is the case for a variety of regulated emissions, including nitrogen oxides, carbon monoxide and volatile organic compounds.

The technology requirements incorporated in the draft permit are equally impressive. These requirements include selective catalytic reduction for controlling emissions of nitrogen oxides and systems to reduce the venting of natural gas into the atmosphere. Here again, I believe the standards imposed on this "minor" source are much more typical of requirements for the operation of larger facilities with higher levels of emissions.

The Department of Environmental Quality has a proven track record, spanning many years, of protecting the Commonwealth's natural resources, including its air quality. You have brought that same level of dedication to the development of the draft air permit for the Buckingham Compressor Station. I believe Virginia must move forward toward a more secure and reliable energy future and that the ACP is a key to that move. But I also believe we must take strong steps to safeguard the environment as we build that more secure future. The draft permit for the compressor station is one of those strong steps, and I commend you for it. Thank you again for the opportunity to present my comments to you.

Sincerely,

David A Christian
[117 Lakeview Drive](#)
[Toano, Va. 23168](#)
804-382-2350

Sent from my iPhone

CONFIDENTIALITY NOTICE: This electronic message contains information which may be legally confidential and or privileged and does not in any case represent a firm ENERGY COMMODITY bid or offer relating thereto which binds the sender without an additional express written confirmation to that effect. The information is intended solely for the individual or entity named above and access by anyone else is unauthorized. If you are not the intended recipient, any disclosure, copying, distribution, or use of the contents of this information is prohibited and may be unlawful. If you have received this electronic transmission in error, please reply immediately to the sender that you have received the message in error, and delete it. Thank you.



Air Division 1, rr <airdivision1@deq.virginia.gov>

Extend Comment Period for the Buckingham Compressor Air Permit

1 message

Amy Cleveland <BostonMass43@gmail.com>

Fri, Sep 21, 2018 at 3:10 PM

Reply-To: BostonMass43@gmail.com

To: airdivision1@deq.virginia.gov

The concept of "tzedek" comes from the Jewish faith tradition, calling for justice and equity among all people. The vision of tzedek is one of environmental justice and clean and safe air for all to breathe. The proposed Atlantic Coast Pipeline (ACP) compressor station violates this concept as it would expose residents in Union Hill and Buckingham County to leaking pollutants such as methane gas, formaldehyde, benzene, arsenic, uranium and additional toxic volatile organic compounds (VOCs).

This 54,000+ horsepower compressor station is one of the largest that Dominion has ever built and the largest in Virginia, further endangering health of residents and increasing risk and vulnerability. Having clean air is a fundamental human right and is especially vital for children and the elderly, some of the most vulnerable to the negative impacts of inhaling pollutants.

Many of the world's major faith traditions have a mandate to care for the Earth. By doing so, we care for each other. I submit this comment with love to express my solidarity with the community of Buckingham and their health and safety concerns stemming from the construction and operation of this massive compressor station.

I urge the VA State Air Pollution Control Board and the Department of Environmental Quality (DEQ) to extend the 30-day comment period to at least 60 days, to ensure meaningful participation by impacted populations in permitting and monitoring, and to immediately complete a thorough Quantitative Risk Assessment (QRA) and a Comprehensive Health Impact Assessment (CHIA) prior to any future permitting.

I further urge the VA State Air Pollution Control Board and the DEQ to abide by the principles of environmental justice as the compressor station is proposed to be sited in Buckingham County's historic Union Hill, an 85% African American community. It is unacceptable that our society continues to disproportionately burden the poor and people of color with increased levels of dangerous air pollution.

Being unable to take a deep breath of clean air to pray or meditate at the many nearby religious sites such as Union Hill and Union Grove Churches and the LOTUS Temple, one of the many sacred places in Satchidananda Ashram Yogaville, is an egregious violation of humanity.

The risks to our sacred gift of air posed by Dominion's proposed ACP compressor station are simply too high.

Ms. Amy Cleveland
6247 Jefferson Park Rd #F
Richmond, VA 23875
8043343077



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Michael Cogan <Michael.Cogan.109194754@p2a.co>

Fri, Sep 21, 2018 at 4:40 PM

Reply-To: mike32678@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Michael Cogan
[10114 Jennings Branch Ct](#)
[Mechanicsville, VA 23116](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Don cogar <Don.cogar.116339089@p2a.co>
Reply-To: doncarla@ntelos.net
To: Ann Regn <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 5:00 PM

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Don cogar
[142 Draft Ave](#)
[Stuarts Draft, VA 24477](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Dianne Corsello <Dianne.Corsello.108285141@p2a.co>

Fri, Sep 21, 2018 at 4:35 PM

Reply-To: perrycorsello@verizon.net

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Dianne Corsello
[13424 College Valley Ln](#)
[Richmond, VA 23233](#)

**Deny the Buckingham Compressor Station air permit**

1 message

William Cranor <wpcranor@gmail.com>

Fri, Sep 21, 2018 at 5:55 PM

Reply-To: wpcranor@gmail.com

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

I respectfully urge you to deny the draft minor source air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station.

This compressor station poses a direct threat to our climate, our air quality, and - most importantly - to the lives of the historic freedman and largely African American Union Hill community. If built, the compressor station would emit methane, nitrogen oxides, volatile organic compounds and particulate matter into the air in close range to community members' homes and would be a stark example of environmental racism at play in the Commonwealth.

We ask that you deny this permit and request that the following concerns be addressed:

- DEQ and the Air Board must ensure that the permit for the Buckingham Compressor Station does not disproportionately impact marginalized communities. However, the vast majority of residents in close proximity to the proposed compressor station site - 85% - are people of color, and a large proportion are elderly or very young. Therefore, a disproportionate impact on an environmental justice community is virtually guaranteed. If the project cannot be modified to avoid this outcome, the air permit should be denied.
- ACP has not shown that the amount of toxic air emissions from the compressor will not cause or contribute to the endangerment of human health. DEQ should conduct a baseline Health Impact Assessment to better understand what ailments already exist in the community that could be exacerbated by these emissions. The elderly, very young, and community members who already have respiratory health issues are particularly at risk.
- DEQ should require ACP to continuously monitor nitrogen oxide emissions to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ should conduct further analysis of the greenhouse gas emissions associated with this proposed compressor station. While Virginia is poised to begin regulating carbon dioxide emissions from electric power plants, ignoring the greenhouse gas emissions from the infrastructure used to supply those power plants is self-defeating. With each new pipeline and compressor station built, significant amounts of methane are emitted into the atmosphere, exacerbating climate change impacts. Though methane does not last in the atmosphere nearly as long as carbon dioxide, methane is much more efficient at capturing radiation than carbon dioxide and, pound for pound, the comparative impacts of methane to carbon dioxide are 25 times greater over a 100 year period. Greenhouse gas emissions are mentioned in the draft air permit, but further analysis of impacts and plans to mitigate those emissions are necessary.
- ACP has not adequately addressed emergency response plans. Detailed plans should be drafted and shared with the community. These plans should outline evacuation and actions in response to an explosion or other emergency at the Buckingham compressor station. At this time, there is no certainty that residents could be evacuated promptly, and Buckingham County emergency responders do not have the supplies or resources to respond to a significant industrial emergency.

It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station. I urge you to deny the permit.

Sincerely,

William Cranor
918 Nelson Street
Staunton, VA 24401
540-294-4816



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Tina Dakun <Tina.Dakun.11252234@p2a.co>

Fri, Sep 21, 2018 at 5:02 PM

Reply-To: tinagwen6@yahoo.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Tina Dakun
[14625 Earlham Ct](#)
[Woodbridge, VA 22193](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

RE: Buckingham Compressor Station

1 message

William Davies <william.davies@sierraclub.org>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 5:29 PM

Dear Ms. Regn,

I am writing you to submit 74 handwritten grassroots comments collected by Sierra Club Virginia Chapter. Attached is an excel file with the names and contact information of each of the signatories who signed a physical petition, supplementing the 735 Virginians who submitted their comments via email directly to DEQ.

The grassroots comment language is as follows

"I am writing to request that you deny the Stationary Source Permit to Construct and Operate Dominion Energy's proposed Buckingham fracked-gas compressor station as it is inadequate to protect the air quality and public health of Virginians. The permit is particularly inadequate to protect the Virginians in the communities that will be most directly impacted by the station's operation.

A compressor station of this scale is unprecedented in Virginia. The proposed compressor station would be the largest in Virginia's history. Despite this, the draft permit fails to sufficiently explain how the compressor station will impact the community or why the standards and methodologies it relies on to analyze impacts are enough to protect human health.

- In the analysis of the draft permit, the Virginia Department of Environmental Quality states that the proposed compressor station site is "sparsely populated". However, research done by community groups indicates that this is absolutely not true and that there are hundreds of Virginians living close to the site.

- Some residents live as close as half a mile from the proposed compressor station site. Evidence shows people living near compressor stations have suffered from symptoms including gastrointestinal, respiratory, neurological and psychological problems. The draft permit does not explain how the air quality and health of these especially vulnerable residents will be protected over time from harmful air emissions.

- The draft permit will require mostly self-monitoring by Dominion of air quality and emissions. It does not explain why installing further community monitoring technology is unnecessary to protect air quality and human health.

- A Quantitative Risk Assessment and Comprehensive Health Impact Assessment should be conducted to address the complex and multifaceted ways that the health of residents could be impacted by emissions from the compressor station.

- No mention of how air quality emergencies will impact the community or be mitigated is included in the draft permit.

- There is no analysis of how measures in the permit will ensure air quality and health are protected from climate change impacts.

Virginians rely on the expertise of public officials like those on the Air Board to ensure their health and environment is protected. It is imperative that the deficiencies noted above are addressed so that the comprehensive impacts on air quality and the health of Virginians can be adequately considered and addressed before a permit is issued. For these reasons, I respectfully request that the Air Board deny Dominion's permit for the Buckingham Compressor Station."

If you need the physical copies of the grassroots comments for each individual, I will be happy to deliver them. Please contact me if you have any questions or if I may provide further information. Thank you for your time.

Sincerely,

Billy Davies



Billy Davies
Community Outreach Coordinator, Virginia Chapter

Pronouns: he/him/his

[100 West Franklin Street](#), Mezzanine

Richmond, Virginia 23220

804.366.9771 (m)

<http://sierraclub.org/virginia>



Sierra Club Member Signatures Handwritten.csv

6K

First Name	Last Name	Street	City	State	Postal Code	Email Address	Phone
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Tiziana	Bottind	2881 Bowes Ln	Woodbridge	VA	22193	tiziana.bottind@gmail.com	
Kathleen	O'Shea	2250 Greenfield Dr.	Bon Air	VA	23235	kathleenalowe@gmail.com	8016161784
Zachary	Jarjoura	314 W Grace St	Richmond	VA	23220	zachary.jarjoura@serriacub.org	6622925682
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Jesse	Kathorn	10807 Brandberry Ln	Henrico	VA	23233	jkathorn2@gmail.com	
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Kathryn	Tatko	4542 Seminary Rd	Alexandria	VA	22304		7037151456
May	Sligh	1433 Wickhae Pond	Charlottesville	VA	22901	maysligh@yahoo.com	4237621425
Theresa	Terry	8714 Poor Mtn Rd	Bent Mtn	VA	24059	johnterry8@aol.com	5405893789
Lillian	Franklin	6721 Health Circle	Roanoke	VA	24019	Lfranklin5223@gmail.com	5403097392
Robert	Walters	3222 Popcar Ridge Rd	Charlottesville	VA	22911	museuwalt@embarqmail.com	4349784874
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Mark	Frondorf	103 N. Church St	Berryville	VA	22611	Mark@shenandoahriverkeeper.org	5719690746
Daryl	Downing	702 Louisiana St	Richmond	VA	23231	Dtdowning@comcast.net	8048697556
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Bryan	Banning	77 Lakeside Dr	Newport News	VA	23606	bjbanning@email.wm.edu	
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Emily	Bender	4923 Friedens Church Rd	Mt. Crawford	VA	22841		
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Maria	Bergheim	304 Prospect st SW	Leesburg	VA	20175 mbergheim1@gmail.com	
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Ben	Watson	203 Hull Street Rd	Richmond	VA	23225 bwatson@jrava.org	8048393096
Andrea	Levine	201 Hull St Apt 44	Richmond	VA	23224	8046472828
Arminda	Zbesheski	203 N Plum St	Richmond	VA	23220 arminda.zbski@gmail.com	4805890831
Thomas	Franco	705 N 26th St	Richmond	VA	23223 francothomas5@gmail.com	8045171880
Megan	Carlson	6513 Wessex Ln	Richmond	VA	23226 mcarloso0812@gmail.com	3194710356
Zoe	Neale	808 Forest View Dr	Richmond	VA	23225	8048372786
Stephen	Walthall	808 Forest View Dr	Richmond	VA	23225	5402461084
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Barbara Jean	Smith	11912 Hardwood Dr	Midlothian	VA	23114 jeansmith11561@gmail.com	7047014279
Margaret D	Sims	14010 Briars Cir	Midlothian	VA	23114 yesfan23114@hotmail.com	
Johanna	Tunon	13814 Sterlings Bridge Rd	Midlothian	VA	23112	
Ghazala	Hashmi	2711 Bosham Ln	Midlothian	VA	23113	8048976165
Marilyn	Breslow	1443 N. Bon View Dr	North Chesterfield	VA	23235 moselow.fam@verizon.net	8045020430

Kathleen J	Caroselli	1319 Tannery Cir	Midlothian	VA	23113	
Herschell	Emery	3509 Walkers Ferry Rd	Midlothian	VA	23112	herschell.s.emery@gmail.com 8042402968
Benefa	Anning	1409 Creekpointe Ct Apt C	Midlothian	VA	23114	bene2_14@yahoo.com 5047150234
Gail	Christie	3509 Walkers Ferry Rd	Midlothian	VA	23112	gaile.christie@gmail.com 8047446175
Michael	Sims	14010 Briars Cir	Midlothian	VA	23114	
Uva	Branham	14720 Sailboat Cir	Midlothian	VA	23112	uvabranham@verizon.net 8043661949
Joseph	Brancoli	PO Box 17558	Richmond	VA	23226	8043557343



Air Division 1, rr <airdivision1@deq.virginia.gov>

Comments to Air Board

1 message

Swami Dayananda <swdayananda@gmail.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 11:56 PM

Dear Air Board members,

Please see attached my comments on Environmental Justice issue at Union Hill and the compressor station.

Thank you.

Swami Dayananda
108 Yogaville Way
Buckingham, VA 23921
434-607-7419

**Comments to Air Board on Environmental Justice case in Union Hill.docx**
147K

Comments to the Air Board about the Environmental Justice community of Union Hill, Buckingham, VA. A minority, mostly African American neighborhood, faces ACP's massive compressor station in the middle of their community.

Submitted by Swami Dayananda,

108 Yogaville Way, Buckingham, VA 23921 (434-607-7419)

Union Hill residents will receive a disproportionate burden of the air pollution from the 54,000hp compressor station, proposed in the middle of their community.

Yogaville and Union Hill communities have come together since 4 years ago to protect our environment. As a resident in Yogaville, 5 ½ mile away from UH, I am also very concerned about the air pollution affecting the air we breath and the extra air we take in through yogic breathing practices called Pranayama.

But most concerning for me and many others is the health and safety of those whom we come to know well and who have become our close friends. Their homes are within 2 miles of the compressor station. Many are elderly and have medical conditions. This is a community more than 85% minority and mostly African Americans contrary to FERC and Dominion's erroneous statistics of 29.6%. This fact has been uncovered by door to door studies by Friends of Buckingham members and it has not been acknowledged by Dominion.

Union Hill did not receive any significant attention from Dominion in the past four years until Governor's Advisory Council for Environmental Justice (ACEJ) came to Buckingham, toured the sites and met with those who would be impacted. After ACEJ wrote a letter to the governor recommending to review EJ issue surrounding this community, Dominion hired Basil Gooden to speak with community members, offering community improvements such as a recreational center.

Mr. Gooden is a beloved community member who is known by many residents. He seems genuinely interested in making sure that UH community does not end up with nothing in exchange for getting the compressor station in its midst. He and Dominion staff have offered

catered dinner with a meeting during which they made slide presentation and expressed their wish to offer something beneficial for the community and to help with economic development.

Some residents have expressed that nothing Dominion can give could be more important than their health. These people are concerned more about the health and safety of people who live within 2 miles of the compressor station.

I asked a Dominion staff member my concern that no matter what they offer, this is an Environmental Justice case, and as such the compressor station should not be built at UH. People of UH, their children and grand children and their future generation should not be forced to have disproportionate burden of toxic air pollution. He avoided the use of the words “Environmental Justice” and responded that what they want to do is to make sure the community benefits from what Dominion can offer.

It is clear that Dominion will not publicly acknowledge the discrimination, the racism, which is behind their choice of UH for the compressor station. With a promise of gifts and economic development, they may convince many residents to accept the compressor station in return for these temporary benefits. But there are other residents who wish to stand up to this injustice forced on them as African Americans: they want to continue to strive to bring to light what is really happening.

This is my observation of what is happening. Please see attached quotes and letters from VA Environmental Justice Collaborative. They are clear about UH being an Environmental Justice community which needs to be treated with fairness and respect.

I ask the Air Board to please withhold the air permit until you look into this environmental justice issue at Union Hill. Air permit should not be given where there is a group of people whose health will suffer from more pollution because of racism.

Quoted below are the statements from VA Environmental Justice Collaborative:

“Environmental justice is falling through the cracks because each federal or state agency limits its permitting and regulatory authority to fragmented fields of expertise (air *or* water; air *not* safety or noise pollution). This approach excludes comprehensive study of the cumulative risks and hazards faced by impacted residents, and supports denial of responsibility for environmental justice implementation. Thus, EJ communities remain targets for new burdens of toxic producing infrastructure in Virginia.

The Environmental Protection Agency (EPA) defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. NEPA guidelines detail how to implement environmental justice reviews, including:¹

Identification and assessment of environmental justice communities using multiple methods, including inclusive local sources to ensure accuracy; Early, meaningful, inclusive, participatory engagement of impacted communities;

Identification and protection of African American, Native American, and other cultural and historical resources; Comprehensive analysis of the cumulative impacts of air, soil, and water exposures and their combined risks to human health over time, with particular emphasis on vulnerable populations -- elderly, pediatric, minority, and low-income residents;

Assessment of pre-existing medical conditions of fence-line neighborhoods; Equitable access to alternative energy and green infrastructure to reduce toxic burdens.

The Environmental Protection Agency (EPA) defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. NEPA guidelines detail how to implement

environmental justice reviews, including:¹

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Early, meaningful, inclusive, participatory engagement of impacted communities;

Identification and protection of African American, Native American, and other cultural and historical resources; Comprehensive analysis of the cumulative impacts of air, soil, and water exposures and their combined risks to human health over time, with particular emphasis on vulnerable populations -- elderly, pediatric, minority, and low-income residents;

Assessment of pre-existing medical conditions of fence-line neighborhoods; Equitable access to alternative energy and green infrastructure to reduce toxic burdens.

Virginia Energy Policy (Code of Virginia § 67-101) energy objectives include “[developing energy resources and facilities in a manner that does not impose a disproportionate adverse impact on economically disadvantaged or minority communities.”² In 2017, Governor Terry McAuliffe created the Governor’s Advisory Council on Environmental Justice (ACEJ) under Executive Order #73, to provide “a consistent, action-oriented approach to incorporating environmental justice into decision-making.” Governor Northam’s Executive Order #6 includes: “Engaging the regulated community, local governments, and other interested stakeholders in the development of new protocols”; and, “assessing gaps in DEQ resources or authorities necessary to address challenges identified under this review.”

These commitments by Virginia to resolve the environmental and social injustices identified below demand that energy generation choices give highest priority to the health and safety of the public through equitable access to community-oriented renewable energy.

Buckingham Environmental Justice Review

Union Hill is not suitable for a gas compressor station because of geometric comprehensive and cumulative impacts to air, soil, and 100% of drinking water sources with:

ACP Intersection with existing 4-pipeline William's Transcontinental (Transco) at the Union Hill Compressor Station close to water wells, homes, churches; A proposed 54,000+ horsepower compressor station is sited for a majority African American community over 500% more populated than reported by Atlantic Coast Pipeline (ACP) and the Federal Energy Regulatory Commission (FERC),

ACP's horizontal directional drilling at a seasonal flooding, seismic faultline site under the James River risks entire watershed drinking water;

The African American Freedman community of Union Hill lacks historical preservation of historic black schools, churches, slave burials, and gathering places; According to state data and household studies, pre-existing health conditions in proximate households include asthma, chronic bronchitis and other lung disorders, heart disease, diabetes, cancers, and autoimmune conditions; Residents of Union Hill are disproportionately elderly and very young; in all public comment processes impacted residents give strong dissent with specific data for why not to allow a large compressor station in a minority, Freedmen community;

Emergency first response infrastructure in Buckingham is inadequate for industrial scale leaks, fires or explosions.³

For these two EJ communities, we recommend Governor Northam immediately create: An interagency Task Force with involvement of impacted residents to look at and take actions to reduce or avoid the comprehensive impacts of the lateral and ACP pipelines and the Virginia ACP compressor station, since no existing agency has authority to address cumulative air, water, and land releases and exposures; to divide and oversee completion of these tasks:

- 1.Undertake: a. Quantitative Risk Assessments (QRA), b. Comprehensive Health Impact Assessments (CHIA), and c. Statements of Impact which taken together address the environmental justice, public health and safety, and cumulative hazards faced by residents of Buckingham (Appendix 1) and Chesapeake;
- 2.Extend the comment period for the Union Hill Compressor Station air

permit to 60 days;

3. Require Dominion Energy to allow Union Hill community representative(s) to enter the Union Hill Compressor Station site to locate unmarked slave burial gravesites and to have gravesites and other archaeological resources surveyed by an independent or public surveyor for the purposes of historic preservation;
4. Undertake and make public baseline analyses of present drinking water, ambient air, transportation and existing health in these communities; and make that data available to the public without incurring delays and costs of FOIA;
5. Immediately notify parents of public school students at schools located in the blast radius of the Chesapeake lateral connection and Union Hill compressor station, and address concerns they raise; and
6. Require developer-funded bonds for both projects to be held in escrow for Impacted Families to apply for direct assistance who experience any adverse health, mortality, economic, or educational impacts.

For all infrastructure projects, we recommend :

1. Meaningful participation by impacted populations in permitting and monitoring including effective responses to citizen concerns as per Exec. Order #6;
2. Evaluation of climate and environmental justice impacts in all state policies, programs, and permits; 5
3. Reduction of state disparity in exposure by which black and brown communities disproportionately experience harm from toxic air, unsafe water, and public safety risks;
4. Development of equitable access to renewable energy sources (Appendix 2)
5. Creation of an interagency Task Force with involvement of impacted residents to look at and take actions to reduce or avoid the

comprehensive impacts of the lateral and ACP pipelines and the Virginia ACP compressor station, since no existing agency has authority to address cumulative air, water, and land releases and exposures...”

Thank you.

Respectfully submitted,

Swami Dayananda



Air Division 1, rr <airdivision1@deq.virginia.gov>

Comment for Air Board

1 message

Swami Dayananda <swdayananda@gmail.com>
To: airdivision1@deq.virginia.gov


Fri, Sep 21, 2018 at 10:22 PM

Dear Air Board members,

Please find my comments and two attachments which are the works I refer to on my comments. Please note that the author of the second attachment is Dr. Larysa Dyrzka whose address is: PO Boc 355, 124 Chapin Trail, White Lake, NY 12786 (Phone: 845-583-4381)

Thank you.

Swami Dayananda
4368 Warminster Church Road
Buckingham, VA
23921
434-969-6148 (home)
434-607-7419 (cell)

3 attachments **Air Permit Hearing Sept. 11, 2018 SD comments.docx**
129K **Curt Nordgaard ACP BCS air permit comments.doc**
38K **Dyrzka ACP Buckingham compressor air comments 08272018.pdf**
1058K

Air Permit Comments presented at Public Comments period on Sept. 11, 2018 by Swami Dayananda

My name is swami Dayananda; I am from Yogaville, Buckingham, VA

I am here to ask the Air Board to not approve the air permit for the proposed Buckingham compressor station by Atlantic Coast Pipeline.

First, due to the insufficiency of the National Ambient Air Quality Standard, our health is not protected from the potentially serious health risks from the toxic emission from the compressor station.

DEQ staff members assured us that this compressor station meets all the regulations under this standard and therefore safe. But on whether these standards are sufficient, there was no reassuring answer.

Dr. Nordgaard, a pediatrician at Boston Medical Center, citing many academic studies, concludes that "air pollution is harmful even if the national standards are not violated."

In 2015, American Medical Association with many other health organizations conducted studies and declared that "...the existing standards fail to protect public health with a margin of safety..."

DEQ staff members also did not offer any direct answer to the question on health impacts from the mixtures of pollutants once they were emitted in the air.

Dr. Dyrzka of Physician's for Social Responsibility writes that:

"...standards are set in a form that inaccurately determines health risks because they do not fully consider the potential synergistic combination of toxic air emissions."

Both of these doctors' papers are attached to my comments.

The fact is that the Nat'l Ambient Air Quality Standard as it exists now does not fully protect the citizen's health. I would like to ask the good people of DEQ to acknowledge this as they do their best within the national standards.

I know that VA DEQ did not create the federal standards nor can you change them. But what the Air Board can do to protect VA's citizens' health, when the federal regulations do not, is to deny the air permit.

Or at the minimum, make sure a Comprehensive Health Impact Assessment is done for review before considering the permit again.

On the related topic of Environmental Justice issue, an African American community of Union Hill will be disproportionately burdened with the toxic air pollutants. Their basic human rights to clean air will be violated.

The 15 member Governor's Advisory Council for environmental Justice toured Union Hill and met with the impacted citizens. They then sent a letter to Gov. Northam calling for a review of the ACP's disproportionate impact on people of color, and in particular the population of Union Hill.

When our neighbors are facing such blatant racial discrimination, there is a moral call for the rest of us to stand with the UH community.

That is why I am here and asking you to not give the air permit for this compressor station. Thank you.

Swami Dayananda
108 Yogaville Way
Buckingham, VA, 23921

434-607-7419 (cell)

Requested modifications to the draft Stationary Source Permit for Atlantic Coast Pipeline, LLC to construct and operate a natural gas compressor station at 5297 S James River Hwy, Wingina VA 24599

1 ACP should notify local authorities prior to each venting event

Background

Venting events have the potential to cause disruption and/or nuisance if detected by the public. For example, detecting natural gas odors may result in calls to and activation of local EMS services. ACP should therefore notify local authorities prior to each venting event.

Add a permit condition under Notifications:

“The permittee shall notify the local Board of Health or equivalent entity and the local fire department at least 24 hours prior to each planned or maintenance venting event”.

2 DEQ should require regular analysis and reporting of natural gas composition.

Background

Based upon independent measurements, natural gas contains a large and complex set of VOCs (many of which are hazardous air pollutants and/or known or suspected carcinogens).

There is a research group in the Boston area that has taken independent measurements of VOCs in natural gas samples. A recording of a short presentation describing the study and its results can be found here:

<http://www.bu.edu/earth/naturalgaspublichealth/>

There is a link on the page to “morning session”, the presentation of interest starts in that video around 1 hour 13 minutes.

Condition 16: Fuel Monitoring

Should be modified to ensure that ACP is periodically measuring VOC composition and concentrations in gas flowing through the facility, as this is the gas that will be leaked or released as fugitive and venting emissions.

Replace sentence 2 as follows:

“The permittee shall perform annual fuel analysis of on-site natural gas. The details of the tests shall be arranged with the Piedmont Regional Office. Tests shall identify, at a minimum, VOCs typically reported for EPA methods TO-15 or TO-17 for VOC analysis, and use similar or better reporting limits.”

3 DEQ should require the most recent and stringent emissions controls for pigging operations

Background

A pipeline operator, MarkWest, recently (Apr 2018) reached an agreement with the EPA as a consequence of the company's likely violation of the Clean Air Act during its pipeline pigging operations (see <https://www.epa.gov/enforcement/markwest-clean-air-act-settlement-information-sheet>). As a result of the consent decree, MarkWest is going to publicly release design plans for emissions control technology that will reduce VOC emissions from pigging operations (“Pig Ramps”) as well as educational materials for other technology to reduce VOC emissions from pigging operations (“Jumper Lines”):

“MarkWest will disseminate and make available for use by other oil and gas companies its proprietary design for Pig Ramps, which has been shown to reduce liquid accumulation and emissions from pig launcher and receiver operations. In order to promote the rapid adoption of this innovative device, MarkWest will make available on a public website, no later than six (6) months after the Effective Date, a royalty-free license and information on the Pig Ramp design. MarkWest will also provide educational presentations and host four demonstration or training sessions per year over a three-year period (for a total of 12 sessions), with technical staff available in-person at each session, to demonstrate and encourage the installation and adoption of the technologies developed by MarkWest to reduce VOC emissions from pig launchers and receivers throughout the oil and gas industry. In conjunction with such presentations and demonstrations, MarkWest will develop comprehensive and detailed educational materials on the effective installation, maintenance, and use of Pig Ramps and Jumper Lines to reduce VOC emissions from pig launchers and receivers.”

- MarkWest consent decree, section VI, paragraph 28, pg 16

New Condition:

DEQ should add an Emission Control condition stating that Pig Ramps and Jumper Line technologies be added to pigging facilities within 12 months of their design release by MarkWest. DEQ should release an addendum to the permit once it has determined the operating, testing, and recording conditions for these technologies.

4 Fugitive & vented emissions

Condition 7(b): Emissions Controls

Condition 7 outlines a program to detect and repair leaks that generally follows recent EPA guidelines.

After sentence 4, **insert a sentence** stating that if difficult to repair leaks are small enough to defer repair, then they should be repaired the next time the facility is shut down (unless delaying the repair would result in greater emissions than would result from facility shutdown):

“If a leak is found that will emit less natural gas than a facility shutdown, its repair may be delayed until the next facility shutdown unless the summed aggregate of delayed repair natural gas emissions would exceed the natural gas emissions of a facility shutdown.”

Change last sentence to:

“Records of the daily AVO inspection results, repair attempts...and reason for each delay **shall be submitted on a (monthly/quarterly/annual?) basis to the Piedmont Regional Office and also maintained on site.**”

Condition 51: (SOE) On Site Records

This permit condition should be revised to ensure availability of detailed hexane venting emissions data.

Sentence 4: Change “...calculate the amount of hexane exhausted during **any** venting event.” to “...calculate the amount of hexane exhausted during **each** venting event.”

Sentence 5: Change to “**Hexane emissions shall be calculated monthly and recorded as the emissions for each venting event, as well as the sum of each consecutive 12-month period.**”

Sentence 7: Change to **“These records shall be submitted to the Piedmont Regional Office (monthly/quarterly/annually?) and kept on site** available for DEQ inspection...”

Additional points:

Criteria pollutants are harmful at concentrations or time intervals that do not violate NAAQS. A partial list of supporting peer-reviewed research includes the following studies:

“Ambient air pollution and the risk of ischemic stroke.”

Journal of the American Medical Association, Internal Medicine.

<https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/1108717>

“Ambient fine particulate air pollution triggers ST-elevation myocardial infarction but not non-ST elevation myocardial infarction: A case-crossover study.”

Particle and Fibre Toxicology.

<https://particleandfibretoxicology.biomedcentral.com/articles/10.1186/1743-8977-11-1>

“Low-concentration PM2.5 and mortality: Estimating acute and chronic effects in a population-based study.”

Environmental Health Perspectives.

<https://ehp.niehs.nih.gov/1409111/>

“Fine particulate matters: The impact of air quality standards on cardiovascular mortality”.

Environmental Research.

<https://www.ncbi.nlm.nih.gov/pubmed/29195185>

“The concentration-response between long-term PM2.5 exposure and mortality: A meta-regression approach.”

Environmental Research.

<https://www.ncbi.nlm.nih.gov/pubmed/30077140>

“Association of short-term exposure to air pollution with mortality in older adults.”

Journal of the American Medical Association.

<https://jamanetwork.com/journals/jama/fullarticle/2667069>

“Low level air pollution and exacerbation of existing COPD: A case crossover analysis.”

Environmental Health.

<https://ehjournal.biomedcentral.com/articles/10.1186/s12940-016-0179-z>

“Concentration-response of short-term ozone exposure and hospital admissions for asthma in Texas.”

Environment International.

<https://www.ncbi.nlm.nih.gov/pubmed/28434561>

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Comments regarding the air quality permit from the VDEQ State Air Pollution Control Board for an Atlantic Coast Pipeline Compressor Station

Larysa Dyrszka, MD

August 27, 2018

Shale gas development has the potential to cause adverse health impacts.¹ But due to a set of exemptions this industry received from key federal public health laws², these health issues have only recently begun to come to light.³

Reports of ill health in impacted people became evident over recent years, despite the lack of involvement from federal and state public health and environmental departments. Lists were generated by activists (List of the Harmed)⁴ and surveys compiled (Earthworks' Survey of Health Impacts)⁵. A Health Impact Assessment⁶ started in Battlement Mesa Colorado showed that air pollution was a stressor and particularly significant. And there is still no mechanism in place to monitor or track the health and environmental impacts from gas drilling operations, including the economic costs.

In 2012 Congress commissioned a report⁷ which found that accidents happen and violations occur in this industry frequently, and even the best regulations have not prevented environmental disasters.

Physicians, Scientists and Engineers for Healthy Energy published an analysis of the peer-reviewed literature in 2015. Their results, as of 2015, indicated that at least 685 papers have been published in peer-reviewed scientific journals that are relevant to assessing the impacts of unconventional natural gas development (UNGD). 84% of public health studies contain findings that indicate public health hazards, elevated risks, or adverse health outcomes; 69% of water quality studies contain findings that indicate potential, positive association, or actual incidence of water contamination; and 87% of air quality studies contain findings that indicate elevated air pollutant emissions and/or atmospheric concentrations.^{8 9} There are, as of today, 1565 peer-reviewed studies on fracking in the PSE for Healthy Energy ROGER database.¹⁰

¹ Shonkoff et al. April 2014. Environmental Public Health Dimensions of Shale and Tight Gas Development. EnvHealthPerspectives. Access at: <http://dx.doi.org/10.1289/ehp.1307866>

² <http://www.ewg.org/research/free-pass-oil-and-gas/oil-and-gas-industry-exemptions>

³ Rabinowitz et al. Sept 2014. Proximity to Natural Gas Wells and Reported Health Status: Results of a Household Survey in Washington County, Pennsylvania. EHP. Access at: <http://dx.doi.org/10.1289/ehp.1307732>

⁴ <http://pennsylvaniaallianceforcleanwaterandair.wordpress.com/the-list/>

⁵ Steinzor, N, et al., Investigating Links Between Shale Gas Impacts and Health through a Community Survey Project in Pennsylvania, New Solutions, Vol. 23(1) 55-83 (May 2013). Access at:

<http://www.earthworksaction.org/files/publications/SteinzorSubraSumiShaleGasHealthImpacts2013.pdf>

⁶ Witter R, et al, Battlement Mesa HIA 2011 <http://www.garfield-county.com/environmental-health/battlement-mesa-health-impact-assessment-draft2.aspx>

⁷ http://democrats.naturalresources.house.gov/sites/democrats.naturalresources.house.gov/files/2012-02-08_RPT_DrillingDysfunction.pdf

⁸ <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0154164>

⁹ <https://www.psehealthyenergy.org/our-work/publications/archive/the-science-on-shale-gas-development/>

¹⁰ <https://www.psehealthyenergy.org/our-work/shale-gas-research-library/>

Concerned Health Professionals of New York just completed the fifth edition of a compendium on the risks and health impacts of fracking.¹¹ The Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking (the Compendium) is a fully referenced compilation of the evidence outlining the risks and harms of fracking. It is a public, open-access document that is housed on the websites of Concerned Health Professionals of New York (www.concernedhealthny.org) and Physicians for Social Responsibility (www.psr.org). For this fifth edition of the Compendium, as before, we collected and compiled findings from three sources: articles from peer-reviewed medical or scientific journals; investigative reports by journalists; and reports from or commissioned by government agencies. Peer-reviewed articles were identified through databases such as PubMed and Web of Science, and from within the PSE Healthy Energy database. The studies and investigations referenced in the dated entries catalogued in Compilation of Studies & Findings are current through December 2017.

Two years ago NY State DOH Commissioner, Dr Zucker, advised Governor Cuomo not to approve high volume hydraulic fracturing in NY because of the potential health risks, and he based it on the science.¹² The State of Maryland permanently banned fracking after 2 years of study, based on the potential for adverse public health and environmental impacts.¹³ The EPA HF study has been completed, having only studied water, and shows that water has, in fact, been contaminated.¹⁴

Most importantly, there are many people who have already been impacted in states where gas extraction using high volume hydraulic fracturing is permitted. We posit that a careful study of the scientific information is fundamental to making informed decisions. As we review the studies already completed, and speak with impacted people, we are increasingly aware that fracking and its infrastructure causes stressors on health that cannot be mitigated.

Compressor stations are known to emit carcinogens and other organ system irritants; this is documented in a study by Russo and Carpenter.¹⁵ It has been recommended that a Health Impact Assessment be done prior to permitting compressor stations. The [Shale Health Impact Assessment \(HIA\) Template](#) is designed to give a structured way to bring together data on the community potentially impacted, the expected emissions from shale gas or oil development, and the potential health risks posed to residents in the immediate area. This tool can provide decision-makers with a comprehensive perspective on the siting, expanding, or maintaining of a shale gas or oil compressor station.¹⁶

Recent studies in the field in NY State demonstrate that negative health effects have impacted residents in those communities. Unfortunately, no HIA was done prior to permitting. The studies include [Summary](#)

¹¹ <http://concernedhealthny.org/compendium/>

¹² http://www.health.ny.gov/press/reports/docs/high_volume_hydraulic_fracturing.pdf

¹³ <http://thinkprogress.org/climate/2015/05/29/3664098/larry-hogan-maryland-fracking-ban/>

¹⁴ <https://www.epa.gov/hfstudy>

¹⁵ Russo, PN, Carpenter, DO. Health Effects Associated with Stack Chemical Emissions from NYS Natural Gas Compressor Stations: 2008-2014. October 12, 2017. https://www.albany.edu/about/assets/Complete_report.pdf

¹⁶ <https://www.environmentalhealthproject.org/>

[of Minisink Compressor Station Monitoring Results](#) and [Summary on Compressor Stations and Health Impacts](#).¹⁷

For these reasons (and with more detail provided below) fracking and the associated infrastructure such as compressor stations must be carefully studied and all the risks quantitatively assessed prior to proceeding with any permits.

1) There are concerns about the adequacy and quality of the air modeling study.

Local topography and weather patterns are usually not taken into account in the AEROMOD program. It is recommended to use results with localized data input.

Records of peak emissions which are a primary source of concern for human health are not represented.

2) Health risks from relevant air contaminants receive inadequate treatment.

Averages, peaks and health events

A “tons per year” measurement associated with the assessment of risk to the public’s health near a compressor station is an archaic method, and does not address exposure adequately. Also, the National Ambient Air Quality Standards (NAAQS) used as a benchmark for air quality were not created to assess the air quality and safety in a small geographic area with fluctuating emissions. NAAQS effectively address regional air quality concerns. But these standards do not adequately assess risk to human health for residents living in close proximity to polluting sources such as compressor station sites, where emissions can be highly variable.

Generally, it has been shown that:

- Current protocols used for assessing compliance with ambient air standards do not adequately determine the intensity, frequency or durations of the actual human exposures to the mixtures of toxic materials released regularly at UNGD sites, including compressor stations.
- The typically used periodic 24-hour average measures can underestimate actual exposures by an order of magnitude. There remains the risk of serious harm to human health, including lung disease.
- Reference standards are set in a form that inaccurately determines health risk because they do not fully consider the potential synergistic combinations of toxic air emissions. Thus estimates of yearly totals of contaminants released by a compressor station do not allow for an assessment of the physiological impact of those emissions on individuals. NAAQS reflects what, over a region, over time, is deemed safe population-wide. This is very different than what is safe within for instance 1200 feet of this compressor station. Averaging over a year can wash out important higher spikes in emissions (thus exposures) that may occur at various points throughout the

¹⁷ <https://www.environmentalhealthproject.org/researchers/resources>

year. What is needed is continuous, minute by minute data on a suite of surrogate compounds being emitted.

Researchers have demonstrated the wisdom of looking at peak exposures as compared to averages over longer periods of time. Darrow et al (2011) write that sometimes peak exposures better capture relevant biological processes. This is the case for health effects that are triggered by short-term, high doses. They write, “Temporal metrics that reflect peak pollution levels (e.g., 1-hour maximum) may be the most biologically relevant if the health effect is triggered by a high, short-term dose rather than a steady dose throughout the day. Peak concentrations ... are frequently associated with episodic, local emission events, resulting in spatially heterogeneous concentrations....”¹⁸ Delfino et al (2002) posited that maxima of hourly data, not 24-hour averages, better captured the risks to asthmatic children, stating, “it is expected that biologic responses may intensify with high peak excursions that overwhelm lung defense mechanisms.”¹⁹ Additionally, they suggest that “[o]ne-hour peaks may be more influenced by local point sources near the monitoring station that are not representative of regional exposures....”²⁰

A specific example:

An EPA ATSDR report on air emissions from the Brighich compressor station in PA (2016) calculated detailed non-cancer and cancer risk evaluations that included excess lifetime cancer risk calculations for a subset of the constituents of potential concern. ATSDR concluded that, in general, these more detailed non-cancer and cancer exposure evaluations did not support the likelihood of human health harm from these air pollutants, although ATSDR could not rule out that some sensitive subpopulations may experience health impacts from hydrogen sulfide, PM2.5 or carbonyls.²¹

Hydrogen sulfide was monitored continuously, documenting the variability of potential exposures, along with the average. Spikes of H₂S were quite high. EHP has similar finding from measurements of PM_{2.5} near compressor stations.

ATSDR has established that there were levels of exposure around the compressor station that raise health concerns. In particular, acetaldehyde, benzene, formaldehyde, carbon tetrachloride, chloroform, 1,2-DCA and 1,1,2-trichloroethane, crotonaldehyde, and 1-methoxy-2-propanone exceeded their respective comparison values (CVs).

¹⁸ Darrow LA, Klein M, Sarnat JA, Mulholland, Strickland MJ, Sarnat SE, Russell A, Tolbert PE. The use of alternative pollutant metrics in time-series studies of ambient air pollution and respiratory emergency department visits. *Journal of Exposure Science and Environmental Epidemiology*. 2011;12 (1): 10-19.

¹⁹ Wolf Eagle Environmental. Town of DISH, Texas Ambient Air Monitoring Analysis Final Report. September 15, 2009.

²⁰ Delfino R, Zeiger RS, Seltzer JM, Street DH, McLaren CE. Association of asthma symptoms with peak particulate air pollution and effect modification by anti-inflammatory medication use. *Environmental Health Perspectives*. 2002; 110(10):A607-A617.

²¹ ATSDR Health Consultation Exposure Investigation Natural Gas Ambient Air Quality Monitoring Initiative, Brighich Compressor Station Chartiers Township, Washington County, Pennsylvania. Access at https://www.atsdr.cdc.gov/HAC/pha/Brighich_Compressor_Station/Brighich_Compressor_Station_EI_HC_01-29-2016_508.pdf

SWPA EHP has prepared technical reports in response to the ATSDR reports on the Brigich and Brooklyn compressor stations, and they are available on the SWPA EHP website.²²

- At the proposed compressor station, like other industrial facilities, multiple exposures will be occurring simultaneously or in close time frames. The consultants have not calculated cancer risk on an individual chemical basis. It is known that there are combinations of chemicals that increase the cancer risk several fold. This occurs, for instance, when PM_{2.5} is present in the air with carcinogens. The PM_{2.5} can increase a dose several fold by bringing other compounds into the deep lung with the fine particulates. To the extent that chemicals have not just additive but synergistic effects, those effects should be accounted for.
- Mixtures and sequential exposures

Mixtures of pollutants are a critically important topic in addressing the public health implications of UNGD broadly and compressor stations in this case. In fact, a very large number of chemicals are released together. Medical reference values are not able to take the complex nature of the shale environment, its multiple emissions and interactions into full consideration.²³ Chemicals that reach the body interfere with metabolism and the uptake and release of other chemicals. Some chemicals attack the same or similar target sites creating an additive effect. This is the case with chemicals of similar structure such as many in the class of VOCs. Some mixtures like PM and VOC act synergistically to increase the toxicity of the chemicals. Other chemicals released environmentally are rapidly absorbed and slowly excreted. These slowly excreted chemicals will interfere with subsequent actions of chemicals because the body has not yet cleared the effects from the earlier exposure.

The VOCs and HAPs shown in the tables will be emitting air mixtures with high levels of fine particulate matter. Inhaled particulate matter increases transport of the soluble VOCs into the deep lung by a factor of 10 or more. Combination of VOCs with particulates produces a primary synergistic action in air toxicity. Reference values are not determined with particulate matter in the mixtures. Therefore, the URF and the RFCs under represent the inhalation hazard in an atmosphere with high particulate matter.

Similarly, the cancer risk assessment is inadequate. Health Indexes are added when, in fact, there are synergistic effects with multiple chemicals. Thus the results remain inconclusive.

3) The treatment of Particulate Matter (PM) impacts in particular, but also of health impacts from compressors in general, is inadequate.

The air impacts permit application and modeling should address the full range of possible exposures to pipeline ready gas. That includes a human carcinogen, Particulate Matter (PM).

Particulate matter is known to impair lung function, aggravate asthma, cause high blood pressure and heart attack. PM can adhere with other compounds and then can carry these compounds, which may be

²² <http://www.environmentalhealthproject.org/resources/research-factsheets>

²³ For additional information see, for instance, EPA's Integrated Risk Information System Database.

toxic, into the deep lung and this is a health concern near compressor stations where multiple toxins are emitted with PM.

Research by the SWPA-EHP in Minisink, New York, where one of the compressors studied is located, and where the gas is NOT raw field gas, but the same type of gas as traverses through Sullivan County, and presumably will also flow through the Atlantic Coast Pipeline, shows significant human health impacts including respiratory, neurological and dermatological impacts. (see “[Summary of Minisink Compressor Station Monitoring Results](http://www.environmentalhealthproject.org/researchers/resources)” at <http://www.environmentalhealthproject.org/researchers/resources>.²⁴ In addition, and of significant concern, is the observation by 24-hour (continuous) SPECK PM monitoring by the researchers, that dangerous spikes of PM occur and that had no correlation at all with Ambient Air Quality monitors located in Newburgh, NY.

*A presentation can be found at the Town of Mamakating NY website. It is also be found as an addendum following these comments.

4) Radioactive waste

The International Atomic Energy Agency²⁵ and the International Commission of Radiation Protection have recommendations regarding radioactivity at oil and gas mining sites, and most countries which are members adhere to the recommendations. The US is a member but has instead exempted from federal oversight through RCRA (Resource Conservation and Recovery Act) the materials that come from down-hole which are, in many cases, radioactive.²⁶ Brown has reviewed the issue of radioactivity in fracking products.²⁷ It is important to note that some radioactive moieties selectively and preferentially travel with the gas product, namely radon. as radon decays within the pipeline, the solid daughter elements, polonium and lead, accumulate along the interior of the pipes. There is a concern that the gas transiting, and being compressed and regulated, will have radioactivity levels which will put at risk not only the workers at these stations and along the pipeline, but potentially also to the residents. Radon, a gas, has a short half-life (3.8 days) but its progeny are lead and polonium, and these are toxic and have relatively long half-lives of 22.6 years and 138 days respectively. This air permit modeling does not address the potential health risks of the radon decay progeny.

Radioactive waste products are typically removed from the pipelines after “pigging”. How this toxic waste product is removed, handled, stored, transported and disposed of should be made clear to the public.

²⁴ <http://www.environmentalhealthproject.org/resources/research-factsheets>

²⁵ Recommendations from the International Atomic Energy Agency (IAEA) http://www-pub.iaea.org/MTCD/publications/PDF/TCS-40_web.pdf

²⁶ Federal exemption <http://www.epa.gov/osw/nonhaz/industrial/special/oil/oil-gas.pdf>

²⁷ Brown VJ. 2014. Radionuclides in fracking wastewater: managing a toxic blend. Environ Health Perspect 122:A50–A55; <http://dx.doi.org/10.1289/ehp.122-A50>

EPA region 3 reports that radium, measured as gross alpha and beta, in flowback water and produced waste in Pennsylvania wells, is significantly higher than in other shales.

The graphs found here, from a USGS report, illustrate the high radioactivity in Marcellus shale.²⁸

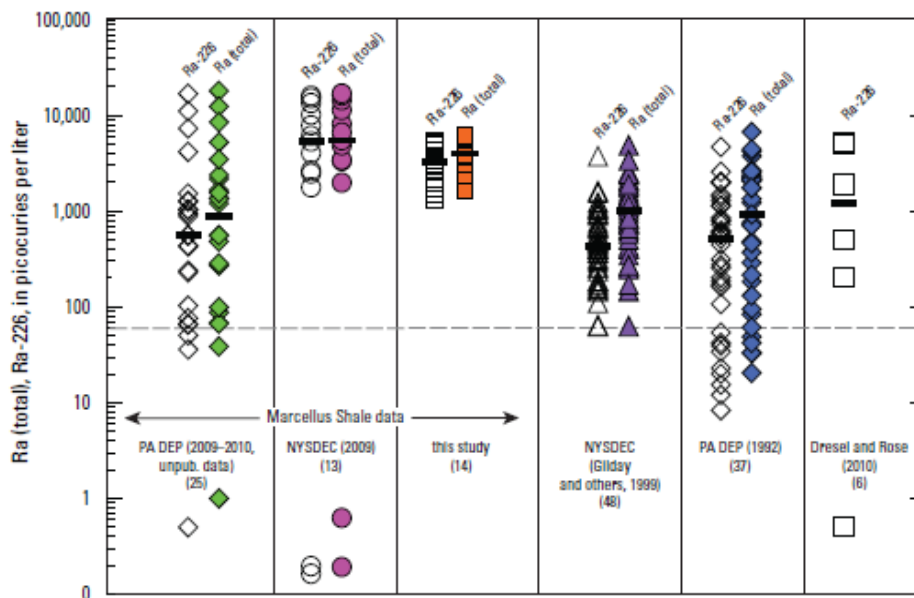


Figure 4. Measured activities for total radium (Ra-226 + Ra-228) and Ra-226 for each of the data sources used in the study. The three datasets for produced water from Marcellus Shale wells are shown on the left; the remaining three datasets are for non-Marcellus Shale wells. The number of points in each dataset is shown in parentheses, and the median values are plotted as heavy black lines. For reference, the dashed line shows the industrial effluent discharge limit (60 pCi/L) for Ra-226 (U.S. Nuclear Regulatory Commission, <http://www.nrc.gov/reading-rm/doc-collections/cfr/part020/appb/Radium-226.html>).

In the 2008 publication of the International Association of Oil & Gas Producers, the authors wrote: “During the production process, NORM flows with the oil, gas and water mixture and accumulates in scale, sludge and scrapings. It can also form a thin film on the interior surfaces of gas processing equipment and vessels. The level of NORM accumulation can vary substantially from one facility to another depending on geological formation, operational and other factors... NORM may accumulate, e.g. at wellheads in the form of scale; at Gas/Oil Separation Plants (GOSP) in the form of sludge; and at gas plants the form of thin films as the result of radon gas decay.

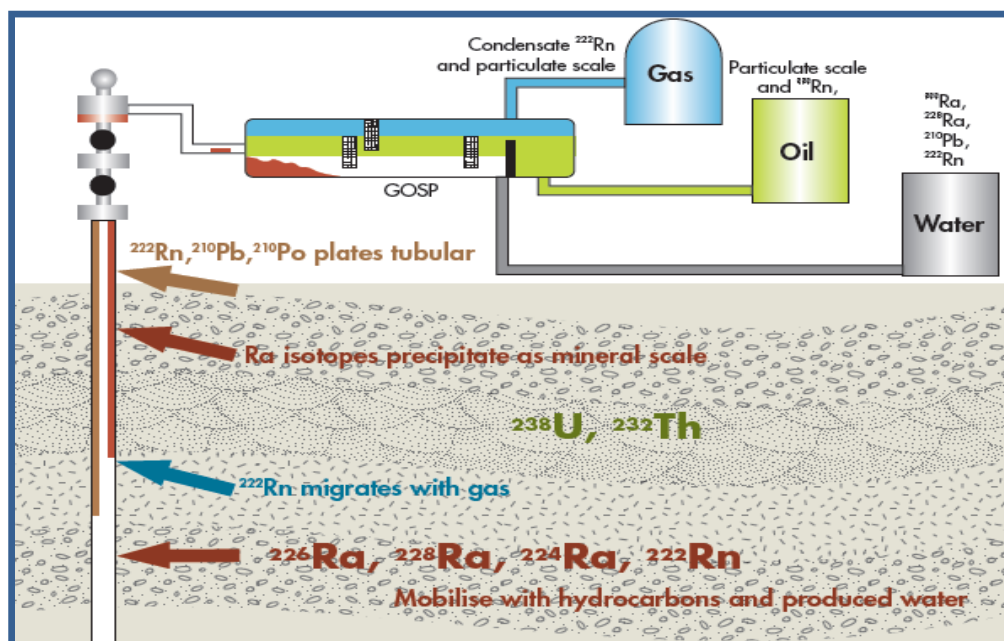
“...radionuclides such as Lead-210 and Polonium-210 can...be found in pipelines scrapings as well as sludge accumulating in tank bottoms, gas/oil separators, dehydration vessels, liquid natural gas (LNG) storage tanks and in waste pits as well as in crude oil pipeline scrapings.”²⁹

This graph from the same publication shows the origins of NORM, as well as where NORM can accumulate.

²⁸ <http://pubs.usgs.gov/sir/2011/5135/pdf/sir2011-5135.pdf>

²⁹ OGP, "Guidelines for the management of Naturally Occurring Radioactive Material (NORM) in the oil & gas industry" International Association of Oil & Gas Producers, Report No. 412, September 2008 <http://www.ogp.org.uk/pubs/412.pdf>

Figure 1.1 The origins of NORM, indicating where NORM may accumulate in the recovery process.



In January 2015, PA DEP released their TENORM report³⁰. The DEP was quick to issue a press memo assuring that “There is Little Potential for Radiation Exposure from Oil and Gas Development”.³¹ Upon careful review of the report and the appendices, it was clear that there were elevated levels of radium and radon which needed to be mitigated; some areas should even be posted as radioactive areas, as per OSHA regulations.³² The report has since undergone changes.

In the PA DEP report, wastewater treatment plants reported the following numbers for liquid waste Ra226:

Figure 4-1. CWT Influent and Effluent Liquid Ra-226 Minimum, Maximum, and Average

Wastewater Source	Filtered or Not	Min (pCi/L)	Max (pCi/L)	Ave (pCi/L)
Effluent	Filtered	18.0	14,900	2,100
Effluent	Unfiltered	42.0	15,500	1,840
Influent	Filtered	57.0	14,100	2,350
Influent	Unfiltered	17.5	13,400	1,870

It is clear that workers at wastewater treatment plants handling gas waste are being exposed to high radiation doses. “The maximum gamma radiation exposure rate measured was 502 $\mu\text{rem/hr}$ on contact with the outside of a wastewater tank. Work in proximity of the tank could potentially result in an

³⁰<http://www.dep.pa.gov/Business/Energy/OilandGasPrograms/OilandGasMgmt/Oil-and-Gas-Related-Topics/Pages/Radiation-Protection.aspx>

³¹ <http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/RadiationProtection/rls-DEP-TENORM-01xx15AW.pdf>

³² <https://www.osha.gov/SLTC/radiationionizing/standards.html>

exposure of 100 mrem in 200 hours of annual exposure or 10 percent of an employee's 2,000-hour occupational year."³³

The method measuring Radium 226 and 228 and their progeny has recently received scrutiny, and a new set of methods has been developed by the EPA in collaboration with Nelson and Schultz at the University of Iowa³⁴. The FPWHFO (flowback and produced water in hydraulic fracturing operations) matrix is considered to be a particularly challenging one due to its extremely high dissolved solids content and its complexity. This new method addresses that complexity.

In brief, the calculations done using the older EPA methods have likely significantly underestimated the radium content of flowback and produced water. Note that the methods used to detect radium in the USGS report³⁵ and in this recent PA DEP report on radioactivity³⁶ (using EPA methods 900 - 904³⁷) may have underestimated the radium content because of the high salinity in the samples.

The gas which enters the pipeline carries gaseous radon with it; and as radon decays within the pipeline, the solid daughter elements, polonium and lead, accumulate along the interior of the pipes. There is concern that the gas transiting, and being compressed, will have radioactivity levels which will be a risk not only to the workers at these stations and along the pipeline, but potentially also to the residents.

Radon was measured at various locations around POTW plants "...at various indoor locations such as break rooms, labs, offices, etc., ...The results ranged from 0.2 to 8.7 pCi/L."³⁸

Radon has a short half-life (3.8 days) but its decay products, lead and polonium, have relatively long half-lives of 22.6 years and 138 days respectively. Lead causes neurologic and hematologic toxicity, and death; polonium causes cancer and death.³⁹ Radon and its radioactive decay products enter the body primarily through inhalation. Most of the radon is exhaled prior to radioactive decay but some of the solid radioactive polonium and lead remain in the lungs and may cause cancer. "Ninety-nine % of the health effects are caused by radon's daughter products; of most significance are the four short-lived ones, polonium-218 to polonium-214 inclusive, which are referred to as radon daughters, radon progeny, or radon decay products."⁴⁰

Following is a description of the fate of radon in a processing plant; however, similar activities occur at a compressor station. Both compressors and processing plants dot Pennsylvania's landscape. "Radon enters the ... piping where it decays into radioactive particulates that are deposited in the piping. During

³³ http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-105822/PA-DEP-TENORM-Study_Report_Rev_0_01-15-2015.pdf pg 4-8

³⁴ http://www2.epa.gov/sites/production/files/2014-08/documents/epa-600-r-14-107_-_gross_alpha_-_gross_beta_508_km_08-08-2014.pdf

³⁵ <http://pubs.usgs.gov/sir/2011/5135/pdf/sir2011-5135.pdf>

³⁶ http://www.portal.state.pa.us/portal/server.pt/community/oil_gas_related_topics/20349/radiation_protection/986697

³⁷ http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/RadiationProtection/Sampling_and_Analysis_Plan-Part-II-Quality_Assurance_Project_Plan.pdf

³⁸ Ibid pg 4-3

³⁹ [National Academy of Sciences 1988 report: Health Risks of Radon and Other Internally Deposited Alpha-Emitters: BEIR IV, page 5](#)

⁴⁰ http://www.inive.org/medias/ECA/ECA_Report15.pdf pg 9

the working lifetime of a ... plant, radon is constantly entering the system and adding to the level of radioactive progeny. Most radon progeny are short-lived, so when a ... plant ceases operations, the short-lived progeny decay quickly. These short-lived radionuclides are the ones that produce the signature gamma ray spectrum that can be detected easily on the outside of the piping. As the short-lived radon progeny decays, it becomes more and more difficult to detect activity from the outside of pipes and tanks, even though there may be detectable radiation on the inside. As the short half-lived progeny decay away, the only radionuclides remaining are the relatively long-lived ^{210}Pb (T_{1/2} 21 y) and its progeny. ^{210}Pb emits a gamma ray at 47 keV and has a transmission of only about 10 to the minus 7 to 10 to the minus 6 through a schedule-40 pipe. Unless the pipe had an access point, internal contamination might not be detectable from the outside.”⁴¹

During production radon usually follows the gas stream. “Radon-222 produces, through natural decay, several radioactive nuclides (also known as radon progeny). Most radon progeny are short-lived, with the exception of Lead-210 and Polonium-210, which have relatively long half-lives.... Most of the radon decay products (90-99%) are attached to ambient aerosols, airborne particulates or surfaces. This can result in forming thin radioactive films on the inner surfaces of gas processing equipment such as scrubbers, compressors, reflux pumps, control valves and product lines.”⁴²

Activity concentration of ^{222}Rn , ^{210}Pb and ^{210}Po in natural gas (Reference 1)

Radionuclide	Reported Range (Bq/m ³)
^{222}Rn	5 – 200,000
^{210}Pb	0.005 – 0.02
^{210}Po	0.002 – 0.08

Activity concentration of ^{210}Pb and ^{210}Po in NGL/hydrocarbon condensate (Reference 1)

Radionuclide	Reported Range (Bq/l)
^{222}Rn (NGL)	0.01 – 1,500
^{222}Rn (C3 -liq)	0.01 – 4,200
^{210}Pb	0.3 – 230
^{210}Po	0.3 – 100

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In 2013, samples of natural gas were analyzed for Spectra and submitted to FERC (public record). The results are as follows:

⁴¹ Krieger. 2005. <http://radonattahoe.com/TENORM.pdf>

⁴² OGP. 2006. <http://www.ogp.org.uk/pubs/412.pdf>

⁴³ <http://www.ogp.org.uk/pubs/412.pdf>

Results of Samples for Spectra Energy

Date	Location	Analyzed ¹	Rn Conc (pCi/L) ²	MDC (pCi/L) ³
12/3/2013	Bechtelsville	12/4 - 12/5	29.9 ± 3.2	0.1
	Bechtelsville	12/11 - 12/12	29.4 ± 3.1	0.3
12/3/2013	Blank	12/4 - 12/5	0.16 ± 0.04	0.07
	Blank	12/11 - 12/12	0.19 ± 0.04	0.27
12/12/2013	Staten Island	12/13 - 12/14	20.6 ± 2.2	0.1
	Staten Island	12/23 - 12/24	20.5 ± 2.2	0.5
12/12/2013	Jersey City	12/13 - 12/14	20.7 ± 2.2	0.1
	Jersey City	12/23 - 12/24	20.4 ± 2.2	0.5
12/12/2013	Blank	12/27 - 12/28	-0.16 ± 0.04	6.69
	Blank	12/31 - 1/1/14	1.38 ± 0.15	12.86
12/16/2013	Ramapo	12/17 - 12/18	26.1 ± 2.8	0.1
	Ramapo	12/26 - 12/27	26.4 ± 2.8	0.4
12/16/2013	Mahwah	12/17 - 12/18	23.0 ± 2.5	0.1
	Mahwah	12/17 - 12/18	23.3 ± 2.5	0.4
12/16/2013	Blank	12/27 - 12/28	-0.23 ± 0.05	0.61
	Blank	12/31 - 1/1/14	0.14 ± 0.04	1.23
12/17/2013	Line 9	12/18 - 12/19	41.6 ± 4.4	0.1
	Line 9	12/30 - 12/31	41.8 ± 4.4	0.7
12/17/2013	Blank	12/18 - 12/19	0.22 ± 0.05	0.09
	Blank	12/30 - 12/31	0.60 ± 0.07	0.76

Radon concentrations between 20 and 41 pCi/L are elevated and could have significant human health impacts.

Table 3-18. Natural Gas Samples from Production Sites

Sample ID	County	Gas Source	Radon Conc. +/- 2 S.D. (pCi/L)	MDA (pCi/L)
WP 08 RG	Washington	Marcellus Shale	79.6 +/- 0.800	0.300
WP 09 RG	Washington	Marcellus Shale	78.8 +/- 4.20	0.300
WP 22 RG	Tioga	Marcellus Shale	42.8 +/- 0.200	0.100
WP 23 RG	Tioga	Marcellus Shale	39.6 +/- 0.800	0.200
WP 24 RG	Tioga	Marcellus Shale	73.8 +/- 0.400	0.200
WP 25 RG	Tioga	Marcellus Shale	44.4 +/- 2.60	0.200
WP 26 RG	Lycoming	Oriskany Sandstone	19.9 +/- 0.200	0.200
WP 27 RG	Tioga	Marcellus Shale	38.4 +/- 3.40	0.300
WP 28 RG	Tioga	Marcellus Shale	40.8 +/- 5.20	0.400
WP 16 RG	Washington	Marcellus Shale	50.0 +/- 5.20	0.300
WP 17 RG	Washington	Marcellus Shale	49.5 +/- 5.80	0.500
WP 19 RG	McKean	Upper Devonian Shale	18.3 +/- 4.40	0.400
WP 20 RG	McKean	Upper Devonian Shale	88.2 +/- 10.6	0.700
WP 21 RG	Forest	Upper Devonian Shale	92.2 +/- 6.40	0.400
WP 04 RG	Tioga	Marcellus Shale	49.6 +/- 29.6	1.20
WP 05 RG	McKean	Marcellus Shale	148 +/- 15.6	1.50
WP 12 RG	Lycoming	Marcellus Shale	37.6 +/- 33.4	2.20
WP 11 RG	Tioga	Utica	5.70 +/- 1.20	0.500
WP 29 RG	Sullivan	Marcellus Shale	23.4 +/- 4.00	0.240
WP 30 RG	Bradford	Marcellus Shale	25.5 +/- 2.70	0.200
WP 31 RG	Bradford	Marcellus Shale	3.00 +/- 1.20	0.300
WP 14 RG	Jefferson	Marcellus Shale	5.60 +/- 0.100	0.140
		Average	47.9	
		Median =	41.8	
		Standard Deviation	34.5	

Note: All results adjusted to account for the fact that Rn was counted in methane, but the scintillation cells were calibrated for Rn in air. Range of α particles is greater in methane than in air. All results divided by 1.054, according to Jenkins et. al., Health Physics, Vol. 106, No. 3, March 2014.

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⁴⁴ <http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-112658/Pennsylvania%20Department%20of%20Environmental%20Protection%20TENORM%20Study%20Report%20Rev%201.pdf>

When it enters the environment, radon gas "... can move to air, groundwater, and surface water. Decay products of ^{222}Rn , such as ^{218}Po and ^{214}Pb , are solids that can attach to particles in the air and be transported this way in the atmosphere. They can be deposited on land or water by settling or by rain. Radon will undergo radioactive decay in the environment."⁴⁵

"...radon and subsequent decay product atoms are charged and tend to attach to aerosol particles. Radon progeny are similarly charged, readily aggregate, form clusters, and attach to dust particles in air. The main health problems arise when primarily those radon progeny that are attached to dust particles (termed the attached fraction) are inhaled, deposit in the airway (particularly the tracheobronchial tree), and irradiate nearby cells repetitively with alpha particles as each atom transforms through the decay chain..."⁴⁶

Regarding workers at gas operations sites and radon exposure, ATSDR notes: "...exposure to high concentrations can occur in any location with geologic radon sources. A list of common occupations that have the potential for high radon and progeny exposure ... include mine workers ... employees of water treatment plants, and radioactively contaminated sites can include ... oil refineries, power plants, and natural gas and oil piping facilities."⁴⁷

The amount of radon released by natural gas operations is not insignificant: "Fishbein (1992) has reported that coal residue and natural gas emissions release 20,000 and 10,000 Ci of ^{222}Rn each year, respectively..."⁴⁸

Interestingly, "Regulations regarding the land disposal of radionuclides, as set forth in 10 CFR 61 (USNRC 2008), do not apply to radium, radon, or its daughters...regulation of radon is up to the individual states."⁴⁹

The gathering of information about radon releases has been limited. "There is no information on releases of radon to the atmosphere from manufacturing and processing facilities because these releases are not required to be reported (EPA 1998)."⁵⁰ The air permit and modeling as proposed do not address radioactivity.

⁴⁵ <http://www.atsdr.cdc.gov/ToxProfiles/tp145.pdf>

⁴⁶ Ibid, pg 16

⁴⁷ <http://www.atsdr.cdc.gov/ToxProfiles/tp145.pdf>, pg 124

⁴⁸ <http://www.atsdr.cdc.gov/ToxProfiles/tp145.pdf>, pg 126

⁴⁹ <http://www.atsdr.cdc.gov/ToxProfiles/tp145.pdf>, pg 118

⁵⁰ Op cit, ATSDR, pg 124



As radon decays within the pipeline, the solid daughter elements, polonium and lead, accumulate inside the pipes. PCBs and other contaminants such as black powder,⁵¹ and anaerobic microbes, do as well.⁵² PIGs (Pipeline Inspection or Intervention Gauge/Gizmo/Gadget⁵⁴) inspect or clean out the pipe, and become repositories of these toxins. These PIGs, with pipe film, black powder, bacteria, scale and sludge, must be removed from the pipeline, stored and eventually disposed.^{55 56 57 58}

⁵¹ Baldwin, Richard M. "Black powder problem will yield to understanding, planning." *Pipeline and Gas Industry* 82 (1999): 109-112. <http://muellerenvironmental.com/Documents/100-056-Black%20Powder.pdf> and Baldwin, Richard M. "Black powder control starts locally, works back to source." *Pipeline & Gas Industry* (1999): 81-87. <http://www.muellerenvironmental.com/Documents/100-058%20Black%20Powder2.pdf>

⁵² Mueller, Fred, and Mark Null. "Impurities in the Gas Stream." Mueller Environmental Designs, Inc. Technical Document, 2005. <http://www.muellerenvironmental.com/public/ProductDocuments.aspx>

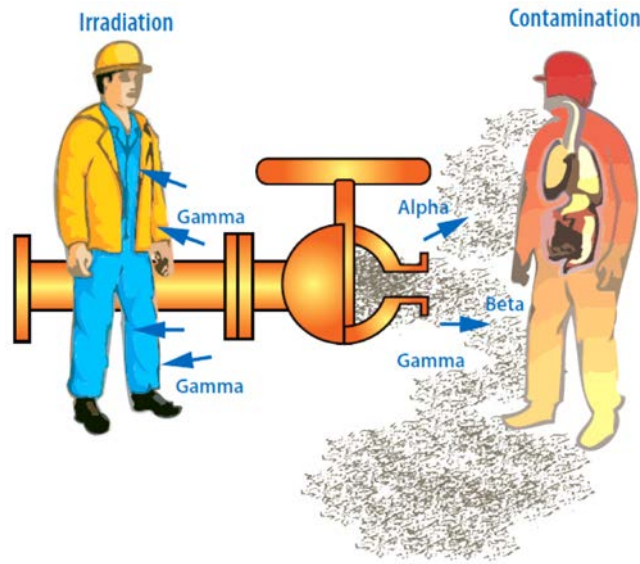
⁵³ Zhu, Xiang Y., John Lubeck, and John J. Kilbane. "Characterization of microbial communities in gas industry pipelines." *Applied and environmental microbiology* 69.9 (2003): 5354-5363. Access at <http://aem.asm.org/content/69/9/5354.full.pdf> <http://en.wikipedia.org/wiki/Pigging>

⁵⁴ http://www.rigzone.com/training/insight.asp?insight_id=310&c_id=19

⁵⁵ http://www.pigtek.com/advanced_pipeline_cleaning.php

⁵⁷ Tsochatzidis, Nikolaos A., and Konstantinos E. Maroulis. "Methods help remove black powder from gas pipelines." *Oil and Gas Journal* 105.10 (2007): 52. <http://www.desfa.gr/files/dimosieyseis/Tsochatzidis%26MaroulisOGJMar2007.pdf>

⁵⁸ Lindner, Hubert. "A new cleaning approach for black powder removal." *Pigging Products and Services Association*, 2006. <http://www.ppsa-online.com/papers/2006-Aberdeen-8-Lindner.Pdf>



NORM materials may become an inhalation risk when the material is dislodged by mechanical forces, such as wire brushing, pipe rattling etc.

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At each step, precautions must be taken to avoid contaminating workers and residents.

“Natural gas plant scale typically consists of Rn decay progeny that accumulate on the interior surfaces of plant pipes and equipment ... As a result, the only radionuclides that remain and adhere to the interior surfaces of machinery/pipes are the Rn decay progeny Po-210 and Pb-210. These longer-lived decay progeny are not readily detected on the outside of pipes. However, Pb-210 and Po-210 emit α and β radioactive particles that may be a potential inhalation or ingestion hazard when pipes and machinery are opened for maintenance and/or cleaning. Access to the internal surfaces of pipes and equipment for surveys of surface α and β activity was not available. However, the facility propenizer equipment opened and sampled during filter change-out is representative of interior conditions... A Pb-210 activity result of 3,580 pCi/g was identified.... The results confirm the build-up of the longer-lived Rn decay progeny in equipment and pipes. The concentration of Pb-210 identified may present a potential inhalation or ingestion hazard during routine system maintenance.”⁶⁰

Reviewer 6 of the PA DEP report wrote “...that maintenance workers at midstream facilities can also be exposed to Pb-210 and Po-210 when working on internals of pipe and equipment. Progeny tend to plate out on surfaces where there is turbulence in the flow. That would include pumps, elbows, pig launchers/catchers, etc., in addition to the compressor stations themselves.”⁶¹

He continues: “It is the opinion of this reviewer that the alpha and beta contamination potential (and hazard) on well sites and compressor stations, gas plants, et al., is underestimated because there was no access to equipment internals. Also, Po- 210 does not appear to be considered, and that is an internal

⁵⁹ <http://www.ogp.org.uk/pubs/412.pdf>

⁶⁰ <http://www.dep.pa.gov/Business/Energy/OilandGasPrograms/OilandGasMgmt/Oil-and-Gas-Related-Topics/Pages/Radiation-Protection.aspx> sec 6-3

⁶¹ http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-112656/Appendix_L-Peer%20Review%20Comment%20and%20Resolution%20Document.pdf Appendix L page 39 of original document

hazard. Maintenance workers, on and off site (e.g., at repair shops) could be exposed to significant contamination based on years of experience in the industry.”⁶²

Conclusion

There is a growing but already significant body of scientific evidence showing harms to public health from gas development, including compressor stations. And yet, despite this evidence, the monetary costs associated with the health impacts--premature death, birth defects, prematurity of birth, cancer, autism, learning disabilities and other problems--have never been entered into an economic analysis of fracking.

Some have supported gas development for the purported economic boost. The contrary is true—the industry will not be a recession buster.⁶³ From the peer-reviewed literature provided, it is also clear that the economic papers boasting a boon have been industry-sponsored, and have not taken into account the economic loss from existing economies like tourism and agriculture. In addition, the costs of health impacts have never been considered, and those will be significant.

A Health Impact Assessment, as described earlier, should be done to study the potential risks to the nearby population, including all vulnerable groups.

Residents of Buckingham have compiled this reasonable list of public concerns as it regards the DEQ air permit:

- **Request to extend comment period to 30 days;**
- **Address inadequate compliance and monitoring plans;**
- **Address the lack of access to technical documents;**
- **Technical aspects of air permit that have not have been considered, like 24 hr monitoring;**
- **Comprehensive impacts**
- **Take into account the higher radioactivity of Marcellus shale**
- **Consider vulnerable populations such as children, the elderly and infirmed; an HIA would do this.**

and the residents of Buckingham request:

⁶² Ibid, pg L-42

⁶³ <http://theconversation.com/the-false-promise-of-fracking-and-local-jobs-36459>

- A Quantitative Risk Assessment (QRA) and Comprehensive Health Impact Assessment (HIA) to address the complex and multifaceted concerns presented by residents of Buckingham;
- Institutionalization of EJ, public safety, and health review before permitting or construction of large-scale infrastructure in minority and low-income communities;
- Meaningful participation by impacted populations in permitting and monitoring;
- Reduction of state disparity in exposure by which black and brown communities disproportionately experience harm from toxic air, unsafe water, and public safety risks;
- Development of clean and renewable energy alternatives.

At a minimum, the following should be done:

- Cumulative environmental impact study with a comprehensive Health Impact Assessment, including pre- during and post-construction health monitoring;
- Baseline measurements of air emissions, methane, radon and water quality, and continuous monitoring if compressor is approved;
- Cumulative emissions to include condensate tank emissions and fugitive methane;
- Best technologies, and for compressors, electric power source;
- Hazardous Materials Management Plan including plan for disposal of waste from condensate tanks and pipelines, and a NORM Monitoring Plan.

Respectfully submitted,

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ADDENDUM: additional information from a presentation (by Dr L Dyrszka) to several town boards in Sullivan County NY which requested additional information, then passed resolutions in opposition to the Millennium ESU.

POTENTIAL IMPACTS AND HEALTH CONCERNS, WITH A FOCUS ON COMPRESSORS

For an audio presentation on infrastructure, visit <http://www.psr.org/resources/webinar-health-impacts-of-gas-infrastructure.html>

An important impact of the gas infrastructure is an exacerbation of climate change which has been referred to in the journal “Lancet” as a medical emergency.⁶⁴

(Dr. Dyrszka) has recently co-authored relevant publications, and those are referenced here.⁶⁵

Importantly, climate change has national security implications.⁶⁶

In September, scientists at the Climate Implementation Project prepared a report, The Human Face of Climate Change, perspectives and recommendations for the next US President. Burke et al. 2016. Health: The Human Face of Climate Change Perspective and Recommendations for the Next U.S. President.⁶⁷

“A range of studies has shown high levels of methane leaks from gas drilling, fracking, storage, and transportation, undermining the notion that natural gas is a climate solution or a transition fuel. Major studies, some cited here, have concluded that early work by the U.S. Environmental Protection Agency (EPA) greatly underestimated the impacts of methane and natural gas drilling on the climate. Drilling, fracking, the transport and expanded use of natural gas threaten not only to exacerbate climate change but also to stifle investments in, and expansion of, renewable energy. Further, the widely touted claim that the U.S. fracking boom is helping to drive recent declines in carbon dioxide emissions in the United States has been upended by new research showing that almost all of the emission reductions between 2007 and 2009 were the result of economic recession rather than coal-to-gas fuel switching, as was previously presumed.”⁶⁸

⁶⁴ <http://www.climateandhealthalliance.org/news/2015-lancet-commission-on-health-and-climate-change>

⁶⁵ Webb et al. 2016. Potential hazards of air pollutant emissions from unconventional oil and natural gas operations on the respiratory health of children and infants. June 1, 2016. RevEnvironHealth. DOI:

10.1515/reveh-2014-0070. Access at: <https://www.ncbi.nlm.nih.gov/pubmed/27171386>

Too Dirty, Too Dangerous. 2017. Physicians for Social Responsibility. Access at:

<http://www.psr.org/assets/pdfs/too-dirty-too-dangerous.pdf>

Concerned Health Professionals of New York. 2016. Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking. Access at: <http://concernedhealthny.org/compendium/>

⁶⁶ https://www.eenews.net/assets/2016/09/21/document_pm_02.pdf

⁶⁷ Access at: <https://woods.stanford.edu/sites/default/files/Burke-Walsh-Barry-Paper.pdf>

⁶⁸ CHPNY Compendium

Methane is the second largest contributor to human-caused climate change, after carbon dioxide. Natural gas systems are the single largest source of anthropogenic methane emissions in the U.S., representing almost 40% of total emissions (EPA 2011 data)⁶⁹

Howarth tells us that methane contributes substantially to the greenhouse gas footprint on shorter time scales, dominating it on a 20-year time horizon.⁷⁰

Since the first Howarth paper was published, other studies have shown the need to consider methane emissions at the shorter time scales. Both a report from the United Nations and a paper by Shindell show that controlling CO₂ alone is not sufficient. The only way is to reduce methane emissions, beginning immediately.⁷¹

What evidence is there that the natural gas industry is the #1 source of methane emissions in the US? In an area near Denver Colorado, where gas drilling is the prominent industry, they are losing about 4% of their gas to the atmosphere — and that does not include additional losses in the pipeline and distribution system.⁷²

And recently, a federal agency, the National Oceanic and Atmospheric Agency (NOAA), wrote that the rate of methane emissions from natural gas production was 6.2-11.7% of average hourly natural gas production. And this will offset the climate benefits of natural gas over other fossil fuels.⁷³

This body of research tells us that methane emissions from unconventional gas development have been significantly underestimated by both the gas industry and the US EPA. Methane leaks have to be kept below 2 % for natural gas to be better than coal for slowing climate change.

The 2014 Intergovernmental Panel on Climate Change (IPCC) warns us that impacts of climate-related extremes include alteration of ecosystems, disruption of food production and water supply, damage to infrastructure and settlements, morbidity and mortality, and consequences for mental health and human well-being... People who are socially, economically, culturally, politically, institutionally, or otherwise marginalized are especially vulnerable to climate change...⁷⁴

And climate change impacts human health, documented for example by Drs Sheffield and Landrigan, and others.

“The overall risks of climate change impacts can be reduced by limiting the rate and magnitude of climate change.” These risks are all dependent on the emission scenarios, and all within our control.

- 2009 Sheffield and Landrigan. Global climate change costs significant healthcare dollars “Global Climate Change and Children’s Health: Threats and Strategies for Prevention”⁷⁵

⁶⁹ http://www.psehealthyenergy.org/data/PSE_ClimateImpactsSummary_ALLCitations_01Feb2013.pdf

⁷⁰ <http://link.springer.com/article/10.1007%2Fs10584-011-0061-5> and http://www.eeb.cornell.edu/howarth/publications/Howarth_et_al_2012_National_Climate_Assessment.pdf

⁷¹ Shindell et al, Improved attribution of climate forcing to emissions, Science.

⁷² http://www.nature.com/polopoly_fs/1.99821/menu/main/topColumns/topLeftColumn/pdf/482139a.pdf

⁷³ <http://onlinelibrary.wiley.com/doi/10.1002/grl.50811/abstract>

⁷⁴ <http://ipcc-wg2.gov/AR5/report/>

⁷⁵ <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3059989/>

- 2009 Shindell. Methane is a potent greenhouse gas, 33 times more efficient at trapping heat than carbon dioxide over 100 years, and about 100 times more potent than carbon dioxide over 20 years.⁷⁶
- 2011 Howarth, Santoro and Ingraffea. “The footprint for shale gas is greater than that for conventional gas or oil when viewed on any time horizon, but particularly so over 20 years.”⁷⁷
- 2012 Tollefson. In an area known as the Denver-Julesburg Basin, where gas drilling is the prominent industry, they are losing about 4% of their gas to the atmosphere — not including additional losses in the pipeline and distribution system.⁷⁸
- 2012 Howarth. While methane is only causing about 1/5th of the century-scale warming due to US emissions, it is responsible for nearly half the warming impact of current US emissions over the next 20 years.⁷⁹
- 2012 Myhrvold, N. P. and K Caldeira. The carbon dioxide emitted from burning natural gas contributes significantly to greenhouse gas emissions driving global climate change.⁸⁰
- 2013 NOAA and CIRES. An emission rate corresponding to 6.2-11.7% of average hourly natural gas production in Uintah County was measured in the month of February.⁸¹
- 2014 Intergovernmental Panel on Climate Change (IPCC). Impacts of climate-related extremes include alteration of ecosystems, disruption of food production and water supply, damage to infrastructure and settlements, morbidity and mortality, and consequences for mental health and human well-being... People who are socially, economically, culturally, politically, institutionally, or otherwise marginalized are especially vulnerable to climate change...⁸²

⁷⁶ Shindell et al, Improved attribution of climate forcing to emissions, Science.

⁷⁷ <http://link.springer.com/article/10.1007%2Fs10584-011-0061-5>

⁷⁸ http://www.nature.com/polopoly_fs/1.9982!/menu/main/topColumns/topLeftColumn/pdf/482139a.pdf

⁷⁹ http://www.eeb.cornell.edu/howarth/publications/Howarth_et_al_2012_National_Climate_Assessment.pdf

⁸⁰ http://iopscience.iop.org/1748-9326/7/1/014019/pdf/1748-9326_7_1_014019.pdf

⁸¹ <http://onlinelibrary.wiley.com/doi/10.1002/grl.50811/abstract>

⁸² <http://ipcc-wg2.gov/AR5/report/>

MILLENNIUM'S PROPOSED EASTERN SYSTEM UPGRADE PROJECT



• Eastern System Upgrade Project includes

- the addition of a new 22,400 hp compressor unit at Millennium's existing Hancock Compressor Station;
- the construction of a 22,400 hp new compressor station in Sullivan County, NY;
- the installation of approximately 7.3-miles of pipeline between Millennium's existing Huguenot and Westtown meter stations;
- the addition of facilities at Millennium's existing Ramapo meter station.

The Project will permit Millennium to transport an incremental volume of approximately 200,000 dekatherms per day

From permit applications we know that compressor stations emit:

- Nitrogen oxides (NO_x) which are associated with respiratory disease. Ozone is formed when NO_x and Volatile Organic Compounds (VOCs) react in the presence of heat and sunlight.
- Volatile organic compounds (VOCs) are neurotoxins and have significant cognitive and behavioral effects. They are known hepatotoxins, reproductive toxins and fetotoxins, and have been associated with teratogenesis and fetal wastage. All are dermatotoxins.
- Formaldehyde which is a carcinogen.
- Sulfur dioxide (SO₂) is associated with respiratory and neurological illness, and death.
- Particulate matter is of small size and carries toxic pollutants deep into the lungs, and is a carcinogen.

Following are the projected emissions from the ESU (from page 131 of the Millennium EA). Just the newly constructed compressors, not including the previously built Hancock compressor nor the metering/regulating stations, nor the Minisink compressor which really is part of this project, as well as the CPV power plant, will add over 200,000 tons per year of CO₂ equivalents.

Table B-17 Summary of Annual Operational Emissions (tpy) ^a								
Facility	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	VOC	CO _{2e}	Total HAPs
Huguenot Loop								
Fugitive emissions	N/A	N/A	N/A	N/A	N/A	4.6E-06	1.5	N/A
Huguenot Meter Station								
Fugitive emissions	N/A	N/A	N/A	N/A	N/A	1.9E-04	6.3	N/A
Westtown Meter Station								
Fugitive emissions	N/A	N/A	N/A	N/A	N/A	1.9E-04	6.3	N/A
Highland Compressor Station								
Proposed compressor	48.59	4.57	78.08	12.27	12.27	5.53	95,690	2.48
Proposed emergency generator	1.36	0.00	2.71	0.02	0.02	0.68	285	0.18
Proposed fuel gas heater	0.53	0.03	0.44	0.04	0.04	0.03	631	0.01
Fugitive and vented emissions	N/A	N/A	N/A	N/A	N/A	0.53	8,466.2	N/A
Subtotal	50.48	4.60	81.23	12.33	12.33	6.77	105,086.2	2.67
Hancock Compressor Station								
Existing PTE	35.21	8.26	49.56	12.49	12.49	4.43	69,718	0.74
Proposed compressor	47.92	4.51	77.28	12.10	12.10	5.45	94,373	2.45
Proposed emergency generator	1.36	0.00	2.71	0.02	0.02	0.68	285	0.18
Proposed fuel gas heater	0.53	0.03	0.44	0.04	0.04	0.03	631	0.01
Fugitive and vented emissions	N/A	N/A	N/A	N/A	N/A	0.54	8,652	N/A
Subtotal	85.02	12.80	129.99	24.65	24.65	11.13	173,659	3.38
Ramapo Meter Station^b								
Existing PTE	12.89	0.08	19.65	1.00	1.00	3.93	15,788	1.35
Fugitive emissions	N/A	N/A	N/A	N/A	N/A	1.9E-04	6.3	N/A
Subtotal^b	12.89	.08	19.65	1.00	1.00	3.93	15,794.3	1.35
PTE = potential to emit								
^a The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.								
^b Operational emissions for the proposed fuel gas heater at the Ramapo Meter Station have not been quantified; however, the planned new heater is unlikely to require major source permitting.								

It is important to note that these numbers are based on projected emissions from modeling. As we have seen previously, this modeling does not take into account large spikes in emissions. Spikes on the order of 400 mcg/m³ have been witnessed during the Minisink study, while the AQI for the day

read in the low teens. These are not accounted for in the emissions modeling. Therefore, the true cost in co2 equivalents, and hence in human health, is much underestimated.

In the EA for Minisink the standards for the air emissions used modelling rather than direct measurements. And based on the modeling, FERC wrote (<https://www.ferc.gov/industries/gas/enviro/eis/2012/03-02-12-ea/section-b.pdf>): "... the Minisink Compressor Station would not be a major source of air emissions under federal air quality permitting programs. In addition, the total potential emissions from the proposed station would comply with the EPA's NAAQS, in accordance with the CAA..."

In other words, they considered this safe. However, the data from a pilot study in Minisink suggests quite the opposite. (see Minisink study <https://sape2016.files.wordpress.com/2014/01/summary-of-minisink-results-public-swpa-ehp.pdf>)

A pediatrician, Dr Curtis Norgaard, writing in DotHouse Health, "A compressor station in New Hampshire: Analysis of health risks", estimated the following health outcomes for a similar compressor in New Hampshire:

Nitrogen dioxide: Increased respiratory hospitalizations (2%), heart failure (1.7%)

Carbon monoxide: Increased premature birth rates (4%), and put women at risk of having low birth weight babies (7%)

Sulfur dioxide: Low birth weight (3%), heart failure (2.4%)

Particulate matter: Increased fatality from heart and lung disease (5.3%), and new childhood asthma diagnoses (10-12%)

The components of natural gas and pipelines are:

- Methane (CH₄)
- Light and heavy alkanes
- BTEX - Benzene, toluene, ethylbenzene, and xylene
- Hydrogen and carbonyl sulfides
- Sulfur Dioxide (SO₂)
- Formaldehyde
- Particulate matter (tiny soot-like particles)
- Carbon monoxide (CO)
- VOCs
- Radon, polonium and lead
- Polychlorinated Biphenyls (PCBs) ⁸³

⁸³ http://sape2016.files.wordpress.com/2013/10/algouquin_incremental_market_project.pdf
http://courses.washington.edu/envir300/papers/Steinzor_et_al_2013.pdf
http://sape2016.files.wordpress.com/2013/10/air_quality_and_climate_impacts_of_shale_gas_operations.pdf

The sources are:

- Emissions and waste from transport vehicles, combustion at compressor stations, storage and condensate tanks, metering stations, processing plants, pipelines, compressor blowdowns, glycol dehydration units, amine units, separators.
- Flaring , venting and leaks⁸⁴

90% of individuals living within two miles of the compressors reported experiencing odor events from these facilities listed here. The exposure is cumulative and costly.^{85 86}

Following are some of the health impacts associated with infrastructure emissions:

NO_x is associated with respiratory disease. Low levels cause eye, nose, throat & lung irritation; coughing, shortness of breath; tiredness, nausea. High levels of exposure can seriously damage tissues in the throat and upper respiratory tract and trigger the build- up of fluid in the lungs. Additionally, nitrogen oxides also contribute to acid rain and can react with other pollutants to form ozone and particulate matter.

Modelling NO_x health effects based on measurements: (from Dr Curtis Nordgaard's presentation)

Health effects for 13.4 ug/m³ increase in NO₂: *New diagnoses* of childhood asthma: Increase 7% *Clinic visits* for asthma (all ages): Increase 4.4% *ER visits* for asthma: Increase by 3.8%.

Hospitalization increased: Asthma (2.2%), COPD (6.7%), stroke (3.7%), heart failure (6.7%)

Death from cardiovascular (1.1%) and respiratory (1.4%) diseases

VOCs (Volatile organic compounds) are organic chemicals that have a high vapor pressure at ordinary room temperature; they are neurotoxins, hepatotoxins, reproductive toxins, fetotoxins, and dermatotoxins. Short-term exposure to VOCs can irritate the respiratory tract and eyes and cause dizziness and headaches. Long-term exposure is linked to cancer and a number of adverse neurological, reproductive, and developmental effects. VOCs can also impact health by combining with nitrogen oxides to form ozone.

⁸⁴ http://www.edf.org/sites/default/files/9235_Barnett_Shale_Report.pdf

<http://www.epa.gov/airquality/oilandgas/pdfs/20120417presentation.pdf>

⁸⁵ http://www.earthworksaction.org/files/publications/SUBRA_3_Shale_Gas_PlaysHealth_Impacts_sm.pdf
<http://www.post-gazette.com/news/state/2013/10/06/Marcellus-gas-facilities-near-to-one-another-or-even-linked-are-evaluated-individually-for-pollution/stories/201310060050>

⁸⁶ Litovitz, Curtright, 2013, "Estimation of regional air-quality damages from Marcellus Shale natural gas extraction in Pennsylvania". Access at http://iopscience.iop.org/1748-9326/8/1/014017/pdf/1748-9326_8_1_014017.pdf and also <http://iopscience.iop.org/1748-9326/8/1/014017>

SO₂ is associated with respiratory illness. At high exposure levels, sulfur dioxide can cause temporary breathing difficulty for people with asthma and long-term exposure to high levels can aggravate cardiovascular diseases. Sulfur dioxide also reacts with nitrogen oxides and other air pollutants to form particle pollution and acid rain, which damages forest and aquatic ecosystems.

Particulate matter also known as particle pollution is made up of a mixture of solid particles and liquid droplets suspended in the air. While some particles such as dust and soot are large enough to be seen with the naked eye, others are so tiny that they can only be viewed with the aid of a microscope. Produced primarily by the combustion of fossil fuels, particulate matter is one of the deadliest air pollutants. Each year, particle pollution causes an estimated 60,000 premature deaths. Fine particles are especially dangerous because they can bypass the body's natural defenses to lodge deep in the lungs where they can pass easily into the bloodstream.

It contributes disproportionately to human health risks, and includes brain lesions resulting in neurobehavioral abnormalities. With small increases in airborne particulate matter exposure, human risks increase for the following:

- Cardiovascular disease-- heart attacks, strokes
- Respiratory disease-- asthma attacks, lung cancer
- Fetal and neonatal illness.
- Childhood illnesses: Pediatric allergies, ear/nose/throat and respiratory infections early in life, impaired lung development in children that affects lung function in adulthood, asthma, bronchiolitis, exacerbation of existing asthma and exacerbation of cystic fibrosis.
- in older people, it can lead to exacerbation of chronic obstructive pulmonary disease, congestive heart failure, heart conduction disorders, myocardial infarction and coronary artery disease, and diabetes in the elderly.
- Cancer

Formaldehyde causes cancer.

Tons of pollutants could seep into the soil and the regional watersheds.

References for health effects:

<http://www.atsdr.cdc.gov/toxfaqs/TF.asp?id=396&tid=69>

<http://www.psr.org/environment-and-health/climate-change/air-pollution/air-pollutants.html>

Wendt JK, et al. (2014). Environ Res, v131, 50-8.

To T et al. (2015). BMJ Open, v5, e009075.

Strickland MJ et al. (2010). Am J Respir Crit Care Med, v182, 307-316. Mills IC et al. (2015). BMJ Open, v5, e006946. <http://www.atsdr.cdc.gov/toxfaqs/TF.asp?id=396&tid=69>

<http://www.psr.org/environment-and-health/climate-change/air-pollution/air-pollutants.html>

<http://www.atsdr.cdc.gov/toxfaqs/TF.asp?id=396&tid=69>

<http://www.psr.org/environment-and-health/climate-change/air-pollution/air-pollutants.html>

<http://www.usatoday.com/story/news/nation/2014/06/09/air-pollution-autism-study/10226445/>

<http://www.atsdr.cdc.gov/toxfaqs/TF.asp?id=396&tid=69>

<http://www.psr.org/environment-and-health/climate-change/air-pollution/air-pollutants.html>

<http://ntp.niehs.nih.gov/ntp/roc/twelfth/profiles/formaldehyde.pdf>

http://www.picarro.com/resources/literature_publications/hydrocarbon_emissions_characterization_in_the_colorado_front_ran_0

**Compilation of complaints from residents living near compressors:
most common COMPLAINTS of residents living near
compressors:**

- Skin rash or irritation
- Eye irritation
- Gastrointestinal problems such as pain, nausea, vomiting
- Respiratory problems such as difficulty breathing or cough
- Upper respiratory problems such as congestion, sore throat and nosebleeds
- Neurological problems such as headaches, movement disorders, dizziness
- Psychological problems such as anxiety, depression, stress, irritability



visualization of emission using a FLIR

camera

And long-term consequences:

- Cardiovascular, such as heart attack and high blood pressure
- Respiratory, such as exacerbation of asthma, COPD
- Neurological such as stroke and cognitive deficits in children
- Birth defects
- Cancer
- Premature mortality

Children and pregnant women are particularly affected in adverse ways by environmental toxins. Children are especially vulnerable to air pollution because their lungs continue to grow and enlarge until about age 18. Plus, they breathe faster and are closer to the ground.

Air pollution has also been shown to be associated with birth problems, neurodevelopmental disorders, lower IQ in babies born to mothers with polycyclic aromatic hydrocarbon exposure during pregnancy and learning disorders in exposed children.

A recent Harvard Public Health study linked an autism spike to air pollution. Children whose mothers were exposed to high levels of fine particulate pollution in late pregnancy have up to twice the risk of developing autism as children of mothers breathing cleaner air. The greater the exposure to fine particulates, the greater the risk.

Overall, although the evidence is just emerging for an association between air pollution and low birth weight, birth defects and neurodevelopmental problems, there is clearly a trend of association with some pollutants at some points during pregnancy and early childhood. These findings clearly demonstrate the need for additional studies as the public health implications of increasing the numbers of premature and low birth weight babies, as well as children with autism and birth defects are enormous.

REFERENCES for health impacts in vulnerable populations:

CEH, 2013, http://www.ceb.org/legacy/storage/documents/Fracking/fracking_final-low-1.pdf World Health Organization http://www.who.int/ceb/capacity/Children_are_not_little_adults.pdf

Wilhelm at UCLA report on air pollution and premature births

<http://www.environment.ucla.edu/reportcard/article.asp?parentid=1700> Perera, 2009

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2864932/>

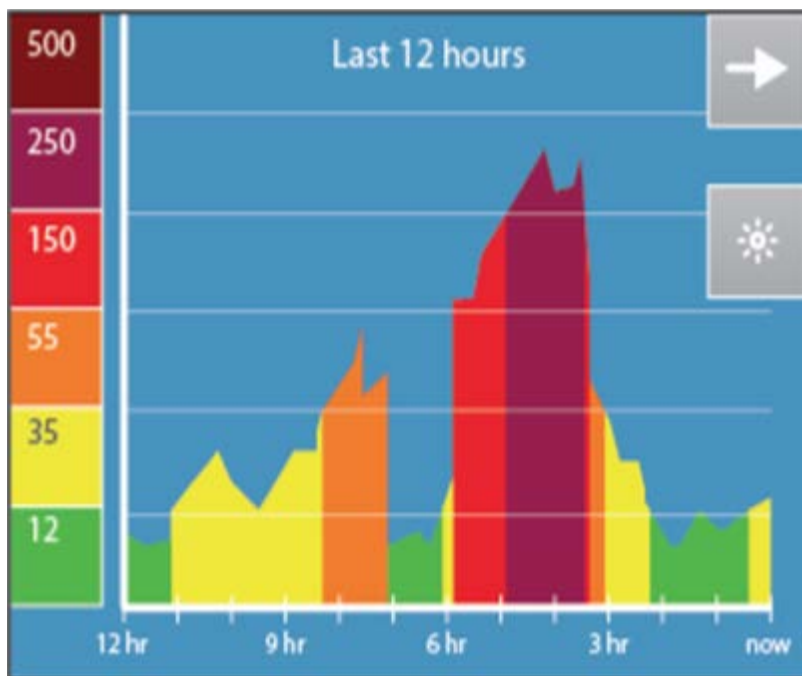
Perera et al, 2006. Effect of prenatal exposure to airborne polycyclic aromatic hydrocarbons on neurodevelopment in the first 3 years of life among inner-city children. Environ Health Perspect. Doi:114(8):1287–1292. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1551985/>

Perera FP et al 2003 Effects of Transplacental Exposure to Environmental Pollutants on Birth Outcomes In a Multiethnic Population. Environmental Health Perspectives 111:2 201-205

Environmental Health Perspectives 111:2 201-205

Weisskopf. December 2014. <http://ehp.niehs.nih.gov/1408133/>

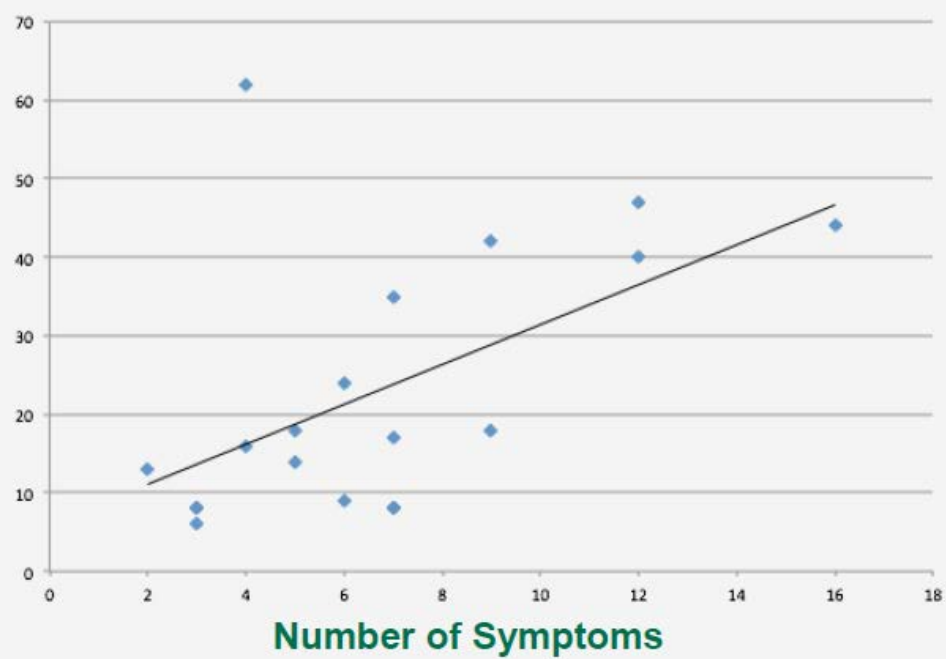
The following graph is a screen shot of a SPECK Particulate Matter monitor 12-hour report. One would expect that symptom severity correlated with the height of the PM measurement.



And it did:

PM 2.5 Peaks vs. Number of symptoms (N=17)

PM Peaks



This alerted SWPA-EHP to review data previously collected.

Particulate Matter (PM) was used as a marker for all the emissions from the compressor. SPECK or DYLOS monitors measured Particulate Matter.

Symptoms were assessed and plotted against the PM peaks.

And they found a correlation between the number of symptoms and PM peaks. In other words, they found that the # of peaks related in a linear fashion to # of symptoms.

The higher the PM monitor readings, the more health symptoms were observed.

The SWPA-EHP Minisink pilot project on compressors (next slide) was a response to a community need and request for an accurate assessment of exposures and health impacts since what they were experiencing as far as health impacts was not in synch with what FERC, the EPA and State agencies were modeling, and then stating that there should be no health impacts. Please recall that the FERC uses models and predictions to arrive at their conclusion. Please note that the measurements that are done by the company or government agencies are on a sampling basis and not continuous.

The SWPA-EHP study included community participation, a health professional to do individual health assessments, continuous monitoring for Particulate Matter both indoor and outdoor, and episodic VOC sampling with summa canisters.

The predominant health impacts reported were:

- Respiratory problems
- Neurological problems
- Dermatological problems
- Overall “quality of life” levels were below normal for half of the respondents when compared to a national standard (SF36).

Individual health assessments were completed on eight families in Minisink. We filled out 35 health intakes, 12 of which were for children. This is the most complete set of intakes from one community yet collected by any group looking at infrastructure health effects.

The residents were given and instructed on SPECK PM monitors to document indoor and outdoor PM. The readings showed significant recurrent spikes in the amount of particulate matter in the air inside and out. The spikes tended to occur at night when stable atmospheric conditions hold particulate matter low to the ground. And based on the residents’ health diaries and individual health assessments, we concluded that it is likely that the spikes in airborne particulate matter are causing acute health impacts in community members.

In reviewing the health data, we found an association between respiratory and neurological affects – specifically headaches – which appeared to be occurring together in this group. Dermatological symptoms (rashes that come and go, and that may be allergic reactions) also appeared in nearly 1/3 of the intakes, along with concerns about health and related stress. These health findings are consistent with information from other research reported in peer-reviewed literature and by other environmental health organizations.

To summarize the health findings, the predominant health impacts reported were:

- Respiratory problems (22, includes 6 experiencing nosebleeds)
- Neurological problems, (12, all of whom report headaches)
- Dermatological problems (10)
- On the SF36, a standardized self-assessment--overall mental health and wellbeing levels were below normal for half of the respondents.

Based on the monitoring results and health intakes, EHP concluded that families living near the Minisink Compressor station are exposed to elevated levels of PM2.5, when compared to the regional AQI.

And further, the episodic nature of health symptoms reported by residents is likely associated with the episodic high emissions that come from the compressor station. This conclusion is supported by the periodically high levels of PM2.5 recorded by the Speck monitors, and the onset of symptoms after the compressor came online, plus no other logical explanation.

REFERENCES for Minisink study:

[Human Exposure to Unconventional Natural Gas Development: A Public Health Demonstration of Periodic High Exposure to Chemical Mixtures in Ambient Air \(Full Appendices\)](#)

[Understanding exposure from natural gas drilling puts current air standards to the test](#)

EHP RESULTS SUMMARIES

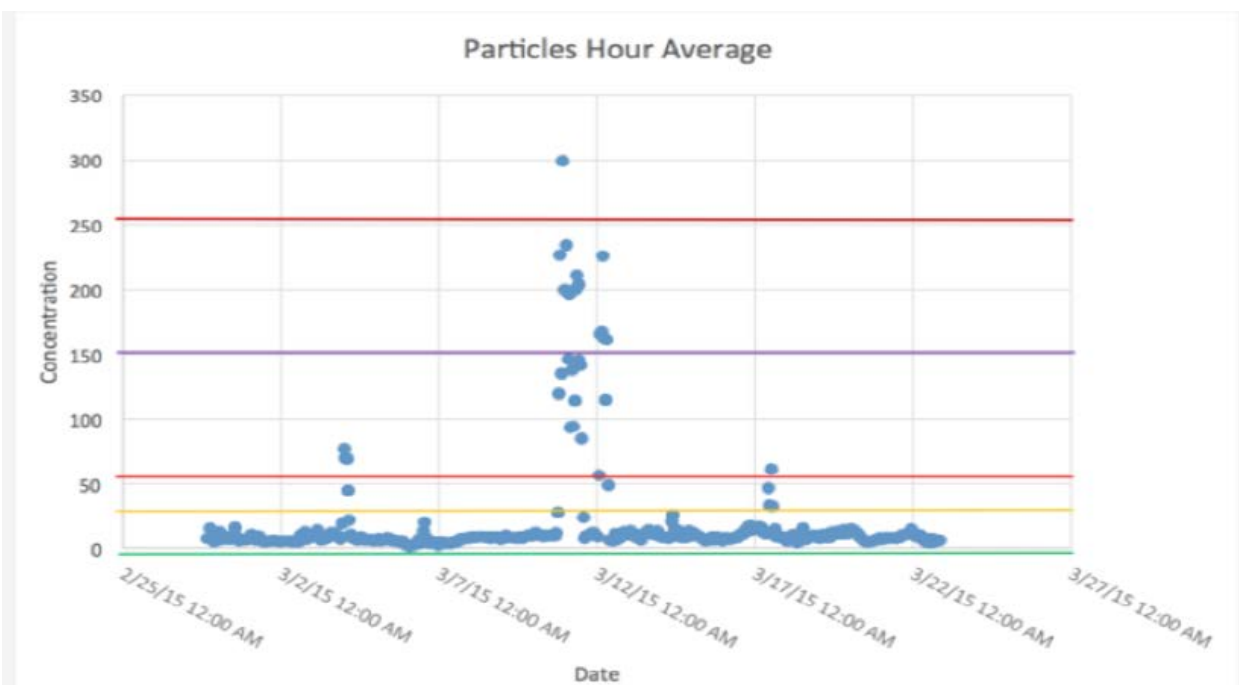
[Physical, Mental and Environmental Impacts of Unconventional Oil and Gas Development](#) Spring 2016

[Summary of Minisink Compressor Station Monitoring Results](#)

[Summary on Compressor Stations and Health Impacts](#) February 24, 2015

EXAMPLE OF SPECK RESULTS (UG/M3)

The speck monitor documented exceptionally high spikes that would not have been captured if averaged over a 24-hr period. The horizontal colored lines correlate with EPA aqi (air quality index) levels and the blue dots show the hourly spikes. The yellow line is the level at which sensitive individuals may be affected.



EPISODIC HIGH LEVELS OF PM2.5 OUTSIDE MULTIPLE HOMES OCCURRED WITHIN SIMILAR TIME FRAMES SEVEN TIMES OVER 59 DAYS. RESULTS ARE BASED ON HOURLY AVERAGES OF UG/M3 VALUES.

Date of Peak event	# of monitors showing a peak out of # in use	Recorded peak levels	Daily <u>AQI</u> average
10/30	3/4	31, 90, 426	5.0
11/5	2/5	33, 57	5.5
11/7	3/5	36.5, 114, 133	5.3
11/12	4/5	53.7, 131, 269, 325	9.0
12/3	3/5	40, 235, 399	5.0
12/6	2/5	76, 160	10.8
12/17	3/5	99, 162, 229	9.9

In the chart above, the data presented shows the episodic high levels of PM, and documented outside multiple homes.

It is clear that the recorded peaks were NOT captured by the AQI daily average (last column on the right). Nor would they be – since it is a 24-hour average for the region.

During the monitoring period, the SPECK monitors recorded at least three times the regional average of 6.3 micrograms per cubic meter (ug/M3), and regularly beyond the Environmental Protection Agency limit of 12. Multiple episodes of peaks into the hundreds were also recorded by Speck monitors.

A study published in June by Harvard epidemiologist Joel Schwartz and his colleagues identified the dangers of PM 2.5 even above 6. Each increase of one microgram per cubic meter increases the mortality rate by 1 percent for people over 65, they found.⁸⁷

SWPA EHP is currently in the process of gathering information on several compressors in NY, in partnership with the Institute for Health and the Environment at Albany and the Madison County Health Dept.

That includes the Town of Highland and the Hancock compressor stations where the baselines have already been done.

The study goals are...

- To assess residents' health status before, during and after construction
- Monitor the environmental factors
- And analyze the results

There is a process which brings public health to the table and which can inform land use decisions and should be used prior to the development of regulations and before permitting. It is particularly important in the case of gas exploration and production.

“HIA IS A SYSTEMATIC PROCESS THAT USES AN ARRAY OF DATA SOURCES AND ANALYTIC METHODS AND CONSIDERS INPUT FROM STAKEHOLDERS TO DETERMINE THE POTENTIAL EFFECTS OF A PROPOSED POLICY, PLAN, PROGRAM, OR PROJECT ON THE HEALTH OF A POPULATION AND THE DISTRIBUTION OF THOSE EFFECTS WITHIN THE POPULATION. HIA PROVIDES RECOMMENDATIONS ON MONITORING AND MANAGING THOSE EFFECTS.”

“IMPROVING HEALTH IN THE UNITED STATES: THE ROLE OF HEALTH IMPACT ASSESSMENT”⁸⁸

⁸⁷

http://www.templeh.org/sites/templeh/files/file/file/minisink_ny_compressor_health_study_fall_2015.pdf

⁸⁸ [HTTP://WWW.NAP.EDU/CATALOG.PHP?RECORD_ID=13229](http://www.nap.edu/catalog.php?record_id=13229)



MEDICAL SOCIETY OF THE STATE OF NEW YORK

May 2, 2015 – The Medical Society of the State of New York adopted a resolution, “Protecting Public Health from Natural Gas Infrastructure,” that recognizes the potential impact to human health and the environment of natural gas pipelines and calls for a governmental assessment of these risks.



AMERICAN MEDICAL ASSOCIATION

June 9, 2015 -- The American Medical Association (AMA) adopted a resolution, “Protecting Public Health from Natural Gas Infrastructure,” that states, “Our AMA recognizes the potential impact on human health associated with natural gas infrastructure and supports legislation that would require a comprehensive Health Impact Assessment regarding the health risks that may be associated with natural gas pipelines.”

This is needed, at a minimum:

- Cumulative environmental impact study with a comprehensive health assessment, including pre- during and post-construction health monitoring
- Baseline measurements of air emissions, methane, radon and water quality, and continuous monitoring if compressor is approved
- Cumulative emissions to include condensate tank emissions and fugitive methane
- Best technologies, and for compressors, electric power source
- Hazardous Materials Management Plan including plan for disposal of waste from condensate tanks and pipelines, and a NORM Monitoring Plan

Larysa Dyrszka, MD

Lar917dy@gmail.com

Co-founder Concerned Health Professionals of NY www.concernedhealthny.org

Exec board member Physicians for Social Responsibility PSR NY www.psr.org

**Deny the Buckingham Compressor Station air permit**

1 message

Spenser Dean <spenserdean@gmail.com>

Fri, Sep 21, 2018 at 10:43 PM

Reply-To: spenserdean@gmail.com

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

I respectfully urge you to deny the draft minor source air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station.

This compressor station poses a direct threat to our climate, our air quality, and - most importantly - to the lives of the historic freedman and largely African American Union Hill community. If built, the compressor station would emit methane, nitrogen oxides, volatile organic compounds and particulate matter into the air in close range to community members' homes and would be a stark example of environmental racism at play in the Commonwealth.

We ask that you deny this permit and request that the following concerns be addressed:

- DEQ and the Air Board must ensure that the permit for the Buckingham Compressor Station does not disproportionately impact marginalized communities. However, the vast majority of residents in close proximity to the proposed compressor station site - 85% - are people of color, and a large proportion are elderly or very young. Therefore, a disproportionate impact on an environmental justice community is virtually guaranteed. If the project cannot be modified to avoid this outcome, the air permit should be denied.
- ACP has not shown that the amount of toxic air emissions from the compressor will not cause or contribute to the endangerment of human health. DEQ should conduct a baseline Health Impact Assessment to better understand what ailments already exist in the community that could be exacerbated by these emissions. The elderly, very young, and community members who already have respiratory health issues are particularly at risk.
- DEQ should require ACP to continuously monitor nitrogen oxide emissions to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ should conduct further analysis of the greenhouse gas emissions associated with this proposed compressor station. While Virginia is poised to begin regulating carbon dioxide emissions from electric power plants, ignoring the greenhouse gas emissions from the infrastructure used to supply those power plants is self-defeating. With each new pipeline and compressor station built, significant amounts of methane are emitted into the atmosphere, exacerbating climate change impacts. Though methane does not last in the atmosphere nearly as long as carbon dioxide, methane is much more efficient at capturing radiation than carbon dioxide and, pound for pound, the comparative impacts of methane to carbon dioxide are 25 times greater over a 100 year period. Greenhouse gas emissions are mentioned in the draft air permit, but further analysis of impacts and plans to mitigate those emissions are necessary.
- ACP has not adequately addressed emergency response plans. Detailed plans should be drafted and shared with the community. These plans should outline evacuation and actions in response to an explosion or other emergency at the Buckingham compressor station. At this time, there is no certainty that residents could be evacuated promptly, and Buckingham County emergency responders do not have the supplies or resources to respond to a significant industrial emergency.

It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station. I urge you to deny the permit.

Sincerely,

Spenser Dean
1638 Hungary Rd
Richmond, VA 23228
8043561299



Deny the Buckingham Compressor Station air permit

1 message

Rebecca Deeds <rebecca.deeds@gmail.com>

Fri, Sep 21, 2018 at 7:15 AM

Reply-To: rebecca.deeds@gmail.com

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

Preservation Piedmont is a non-profit organization dedicated to historic preservation of the built environment, sustainability, preserving the sense of place in our communities, and protecting our neighborhoods in the Virginia Piedmont. We are writing to express opposition to the location of the compressor station related to the Atlantic Coast Pipeline Project in the historic neighborhood of Union Mills in Buckingham County.

Union Hill, a predominately African American community, was founded by former enslaved people soon after the Civil War. This community has historic significance to the piedmont and raises the issue of how the location for the compressor station was selected by FERC.

By utilizing census data to select the location of the compressor station, FERC ignored the characteristics of the neighborhood in its path. We believe that criteria, like historic significance, should factor into this decision making. These compressor stations not only pollute the air, raising health concerns for folks near by, but they also continually emit noise pollution. There are only two compressor stations associated with the Atlantic Coast Pipeline in Virginia and North Carolina, so there should be a more detailed and thorough process for selecting the location. We hope you will consider going back to the drawing board to determine a more suitable location.

Sincerely,
Preservation Piedmont, 2018 Board of Directors

Rebecca Deeds
677 Morven Drive
Charlottesville, VA 22902
4349601590



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

William Detwiler <William.Detwiler.32175390@p2a.co>

Fri, Sep 21, 2018 at 5:45 PM

Reply-To: nuclearnav@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a "minor" source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to "minor" sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
William Detwiler
[8609 Old Brompton Rd](#)
[Chesterfield, VA 23832](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Dan Diefenbach <Dan.Diefenbach.109132202@p2a.co>

Fri, Sep 21, 2018 at 4:19 PM

Reply-To: dandief@live.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Dan Diefenbach
[10830 Wellington Cross Way](#)
[Chester, VA 23831](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

John DiGeronimo <John.DiGeronimo.98780413@p2a.co>

Fri, Sep 21, 2018 at 4:27 PM

Reply-To: jndignmo@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
John DiGeronimo
[21760 Ascot Ct](#)
[Ashburn, VA 20147](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

William Douglas <William.Douglas.117816132@p2a.co>

Fri, Sep 21, 2018 at 4:24 PM

Reply-To: wrdpilot@aol.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a "minor" source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
William Douglas
[4100 Chowan Ave](#)
[Chesapeake, VA 23325](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Susan Duke <Susan.Duke.112655451@p2a.co>

Fri, Sep 21, 2018 at 4:28 PM

Reply-To: shduke1@charter.net

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Susan Duke
[1012 N High St](#)
[Franklin, VA 23851](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Cuong Duong <Cuong.Duong.109073488@p2a.co>

Fri, Sep 21, 2018 at 4:28 PM

Reply-To: ctduong01@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

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Regards,
Cuong Duong
[7013 Leewood Forest Dr](#)
[Springfield, VA 22151](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Comments of the NAM on Buckingham Compressor Station air permit

1 message

Ross Eisenberg <REisenberg@nam.org>

Fri, Sep 21, 2018 at 4:15 PM

To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>

Cc: Rachel Jones <RJones@nam.org>

Attached are comments from the National Association of Manufacturers on VA DEQ's draft permit for the Buckingham Compressor Station. Thank you for the opportunity to submit comments; please contact me with any questions.

Many thanks,

Ross Eisenberg

Vice President, Energy and Resources Policy

National Association of Manufacturers

Direct: 202.637.3173

Mobile: 703.517.1655

Email: reisenberg@nam.org

3 attachments



ACP NSR Permit Buckingham Compressor Station.pdf
126K



Energizing_Manufacturing.pdf
2186K



Economic_Benefits_of_NG.pdf
1714K

Ross E. Eisenberg

Vice President

Energy & Resources Policy

September 21, 2018

David K. Paylor
Director
Virginia Dept. of Environmental Quality
629 East Main Street
Richmond, VA 23219

Re: Draft Permit, Atlantic Coast Pipeline Buckingham Compressor Station

Dear Mr. Paylor:

The National Association of Manufacturers (NAM), the largest manufacturing association in the United States representing manufacturers in every industrial sector and in all 50 states, welcomes the opportunity to comment on the draft New Source Review (NSR) permit for the Buckingham Compressor Station, a vital component of the Atlantic Coast Pipeline project. The NAM supports the Atlantic Coast Pipeline project and we support the timely consideration of a final NSR permit for the Buckingham Compressor Station.

I. Manufacturers' Support for Natural Gas Infrastructure

Manufacturers use one-third of the energy consumed in this country and depend on a secure, affordable, reliable mix of energy resources to remain competitive. Access to natural gas resources is therefore vitally important. Transformative growth in domestic natural gas production is reshaping the U.S. economy and redefining America's competitive advantages. For energy intensive manufacturing sectors such as paper, chemicals, metals, food, and refining, access to robust energy infrastructure plays a key role in keeping American manufacturing competitive in a global economy.

Further, the improved competitive positioning of manufacturing sectors served by natural gas pipelines provides economic development opportunities to communities across Virginia. Proximity to natural gas resources begets new pipeline development which, often through direct access connections to a pipeline, is a fundamental consideration in manufacturing plant site selection. New natural gas pipeline capacity is also needed for the increased utilization of natural gas power generation capacity.

The enclosed comprehensive study from IHS Economics and the NAM reveals how natural gas has strengthened manufacturing, encouraged manufacturing growth and employment and highlights the positive impact to communities around the United States. Manufacturers use natural gas for fuel, such as drying, melting, machine drive

Leading Innovation. Creating Opportunity. Pursuing Progress.

and space heating as well as a feedstock in refining, chemicals and primary metals sectors. Domestic natural gas has transformed the U.S. economy, made our companies more competitive, created jobs and put money back in the pockets of working Americans.

Over the next decade, demand for natural gas will increase dramatically, driven by manufacturing growth and electric power generation. The United States has more than enough supply to meet this growing demand. However, we need major investments in new infrastructure, particularly natural gas pipelines, to ensure manufacturers have a steady, reliable stream.

II. Manufacturers Support the Issuance of a Permit for the Buckingham Compressor Station

For purposes of New Source Review (NSR), the Buckingham Compressor Station is classified as a “minor source,” as opposed to a “major source.” It is my understanding that the project’s sponsor has agreed to emissions limits and control technologies typically found in a major source NSR permit, for facilities with much higher levels of emissions. It is likewise my understanding that the DEQ’s draft air quality permit contains limits four to ten times more stringent than any other compressor station in the Commonwealth of Virginia, as well as the most stringent limits imposed on any minor or major natural gas compressor station in an air quality attainment area in the Commonwealth.

This is a positive story, as is the fact that the DEQ has moved the NSR permit for the Buckingham Compressor Station quickly and efficiently through the permitting process. The NAM has been a vocal proponent of measures at the federal level that would provide tools and resources for states to process NSR permits.

The Buckingham Compressor Station is an integral part of the Atlantic Coast Pipeline, an infrastructure project the NAM strongly supports. Our energy renaissance has put millions of Americans to work and created countless new opportunities for manufacturers. The NAM supports policies that promote access to natural gas resources in an environmentally sound manner. We request that the DEQ continue to allocate the resources necessary to complete the review of a final NSR permit for the Buckingham Compressor Station.

Thank you for your consideration.

Sincerely,

A handwritten signature in blue ink, appearing to read "Ross Eisenberg".

Ross Eisenberg
Vice President
Energy and Resources Policy

Enclosures:

“Energizing Manufacturing: Natural Gas and Economic Growth,” *Center for Manufacturing Research and IHS Economics*, Executive Summary, May 2016.

“The Economic Benefits of Natural Gas Pipeline Development on the Manufacturing Sector,” *IHS Economics*, May 2016.



ENERGIZING MANUFACTURING

NATURAL GAS AND ECONOMIC GROWTH

May 2016

A new comprehensive study from IHS Economics and the National Association of Manufacturers (NAM) reveals how natural gas has strengthened manufacturing, encouraged U.S. manufacturing growth and employment and highlights the positive impact to communities around the United States. Manufacturers use natural gas for fuel, such as drying, melting, machine drive and space heating as well as a feedstock in refining, chemicals and primary metals sectors. Domestic natural gas has transformed the U.S. economy, made our companies more competitive, created jobs and put money back in the pockets of working Americans.

But the story doesn't end here. Over the next decade, demand for natural gas will increase dramatically, driven by manufacturing growth and electric power generation. The United States has more than enough supply to meet this growing demand. However, we will need major investments in new infrastructure, particularly natural gas pipelines, to ensure manufacturers have a steady, reliable stream.

By the Numbers:

- Expanded energy access— **1.9 million jobs economy-wide in 2015**
- Shale gas put an **extra \$1,337 back in the pocket of the average American family**
- New pipelines meant more than **347,000 jobs, with 60,000 in manufacturing**
- Total **natural gas demand is poised to increase by 40%** over the next decade. Key drivers will be manufacturing and power generation. **U.S. supply is expected to increase by 48%** over the next decade to meet new demand.



“Direct access to natural gas pipelines is vital to local production and environmental stewardship.”

For us, access to natural gas pipelines is about commonsense and sustainability. As the largest brick manufacturer in the United States, we produce a product that is heavy, so moving natural gas via pipelines to where the bricks are made is far more efficient than moving heavy bricks long distances.

We've been making the bricks that build schools and homes across America for 125 years. Although “sustainability” is a fairly new term, the basic concept has been part of ACME Brick Company since its founding. Direct access to natural gas pipelines is vital to local production and environmental stewardship.

ACME Brick Company

Photo © David Bohrer/NAM.

“Affordable and abundant supplies of natural gas present U.S. manufacturers with an energy advantage.”

Affordable and abundant supplies of natural gas present U.S. manufacturers with an energy advantage. This benefits companies like ours, because we use it as both a fuel source and a raw material to manufacture products that save far more energy than it takes to produce them. For example, our polyurethane insulation can significantly reduce a building’s energy consumption, while our lightweight polycarbonate increases fuel efficiency in vehicles, thereby reducing CO2 emissions.

Jerry MacCleary
President
Covestro LLC

We need reliable, affordable sources of energy, and that’s why natural gas pipelines are important to our success. For Caterpillar, this is twofold.

“We rely on energy as we design, test and build our products.”

Caterpillar machines also help build the pipelines, and our reciprocating engines, gas turbines and compressors are used to produce the gas and move it through pipelines to businesses and communities across America.

“In the end, a robust pipeline system helps everyone—manufacturers and consumers alike.”

Jim Umpleby
Group President, Energy & Power Systems
Caterpillar Inc.



“...when gas prices were off the charts, it was crazy—we couldn’t be competitive with China.”

As a small business nestled along the Ohio River in Paden City, West Virginia, Marble King, Inc., is small but mighty. Its 28 full-time employees make more than 1 million marbles a day at one of the only marble manufacturers left in the United States. And abundant supplies of natural gas help make this possible.

In a business where pennies separate winners from losers, innovative thinking is imperative. Beri Fox, president of family-

owned and -operated Marble King, is working hard to continue the long-standing tradition of innovation that the company is famous for. When Fox’s father returned from World War II, he found a job as office manager at Marble King. Putting his engineering background and love of science to work in the business, he developed processes that saved the business time and money—like a reforming process that lets the manufacturer recycle glass.

Marble King’s rich history of sustainable and environmentally responsible practices is something for which it is proud. The marbles manufactured for industrial applications are made from 100 percent recyclable glass, so it is not being dumped in landfills. As Fox explained, “We’re helping keep American workers working and helping recycle huge amounts of material.”

But in a global economy, energy cost is something that worries Fox. “We’re a high-volume gas consumer, and when gas prices were off the charts, it was crazy—we couldn’t be competitive with China.” Natural gas powers the process that turns leftover pieces from stained glass window making, other art glass and even old bottles into tiny spheres. “Today, we can be more competitive and a lot of that is because of the lower gas costs,” says Fox.

As a result, one of the last American marble makers continues increasing its presence in new and different industries domestically and around the globe. America was made great by small manufacturers with big dreams. And that’s the power of small.

Marble King, Inc.

“Without natural gas...not only would our production and competitiveness be impacted, so would the 6,000 men and women who work on our shop floors.”

From tractors and combines to powertrain solutions for on and off road and marine, CNH Industrial designs, produces and sells “machines for work.” Without natural gas and the pipeline infrastructure to access these energy resources, not only would our production and competitiveness be impacted, so would the 6,000 men and women who work on our shop floors. Energy and energy infrastructure like pipelines is essential to our businesses and success.

Brad Crews
CNH Industrial



Photo © David Bohrer/NAM.

Energy is the foundation for virtually every aspect of our lives. Investing in better ways to make and deliver clean, safe, reliable and affordable energy—including the modern infrastructure that moves energy to families and businesses across America—is essential to grow the economy, create jobs and improve lives.

Developing the full portfolio of resources—nuclear, 21st-century coal, natural gas, renewables and energy efficiency—gives us a way to strengthen our energy security, economic security and national security.

“We have the ability, through energy, to continue providing real customer solutions, especially for those who continue to struggle to make ends meet.

Inventing the future of energy also means imagining new technologies to use energy more efficiently and make lives better.”

Things like energy storage capability, higher-performing electric vehicles, enhanced security systems and sensors for more effective control of our electronic devices—these and many other exciting developments point to energy’s vast potential to benefit customers and communities.

Thomas A. Fanning
Chairman, President and CEO
Southern Company

“Increased growth and development of natural gas resources...allows us to create more jobs, more paychecks and more opportunities...”

For almost a century, TIW Corporation has been a leader in the design, development and delivery of reliable tools and technologies for the energy sector. Not only because oil and gas producers are our customers, but also because we are energy users—natural gas is essential to our business.

Increased growth and development of natural gas resources across the United States allows us to create more jobs, more paychecks and more opportunities for members of our community.

Steve Pearce
President
TIW Corporation



From Poverty to Prosperity

In a small town once praised for its inspiring ability to overcome obstacles and win support for a high school rocket-building project, there's another story of opportunity on the horizon. A new pipeline is bringing natural gas to a diverse community in a remote part of the Southwest.

Even after building a 10 megawatt solar facility in recent years, energy was still at a premium, and bringing economic development to Presidio, Texas, has been a real challenge. But as the new pipeline winds its way south, a chili processor is now willing to invest in the city's future.

Previously, the lack of natural gas had prevented investment, but Don Biad, managing partner of the Biad Chili Company, explained that the pipeline is a game-changer for small manufacturers. "It's the difference between whether or not our company is profitable or not profitable."

While this economic opportunity brings a wave of hope, the pipeline also brings environmental protection into view for the local communities because much of the natural gas will power modern electricity just across the border in Mexico. Building the pipeline is also helping to rebuild the railroad—once the lifeblood of trade through the town. That's because transporting the steel pipes sparked investments in the rails that moved them from manufacturing facilities to the pipeline construction.

Presidio sits where the Rio Conchos joins the Rio Grande in the Big Bend of Texas; as the hardworking people in this international port town like to say, the rivers join us. So when you talk to Brad Newton, executive director of the Presidio Municipal Development District, his can-do-it optimism is anchored in unity.

"We've been stuck in the politics of poverty, but now we're turning the page to the promising politics of progress. And natural gas is our best new hope for a future—a bright future."

As Newton put it, "The people of Presidio aren't looking for a handout; we just want a level playing field in a world economy. That's what natural gas gives us—a chance to compete."

"...helping fuel manufacturing through investments exceeding \$13 billion..."

Energy Transfer Partners and its affiliates are investing in communities, creating and supporting jobs and helping fuel manufacturing through investments exceeding \$13 billion in new natural gas, natural gas liquids and crude oil pipeline infrastructure projects within the United States. And we spend about 40 percent of our total costs on manufactured goods when building pipelines. These pipeline projects, such as the Rover Pipeline Project, the Mariner East projects and the Dakota Access Pipeline, will provide access to affordable energy supplies that are vital input goods to manufacturers large and small."

Joey Mahmoud
Senior Vice President of Engineering
Energy Transfer Partners

"Critical infrastructure projects allow us to...[turn]... natural resources into a competitive advantage."

Critical infrastructure projects allow us to translate the United States' wealth of natural resources into a competitive advantage for our workers, communities and consumers. For example, CF Industries partnered with Northern Natural Gas to construct a new pipeline in Nebraska and Iowa to bring natural gas safely and efficiently to our expanded plant site in Sergeant Bluff, Iowa. This will allow our site—located in America's Corn Belt—to produce enough fertilizer to nourish more than 10 percent of the total area planted to corn nationally.

Nick DeRoos
General Manager, Port Neal Nitrogen Complex
CF Industries





A Quarter-Century-Old Fleet of Natural Gas Vehicles Moves into the Future

At UPS, our business depends on fuel to power our trucks. At the end of 2015, we had more than 6,500 alternative fuel and advanced technology vehicles in operation, and this ground fleet has traveled more than 500 million miles since 2000 with a goal of driving a billion miles by 2017. That is a goal we believe we will reach.

More than half of that alternative fuel fleet operates on natural gas. UPS began investing in natural gas in the 1980s to reduce our emissions and make use of an affordable domestic resource. Our investments in natural gas vehicles grew slowly at first, but in recent years, our investment has grown exponentially. In 2014, all new tractor trailers that we purchased for our domestic, small-package delivery business ran on natural gas. In one year, these purchases nearly doubled the number of UPS natural gas vehicles in the United States. By year's end, UPS had more than 1,000 compressed natural gas (CNG) medium "package cars" and 1,297 heavy tractors operating on liquefied natural gas (LNG) or CNG. To support our growing natural gas fleet, which is among the largest in the world, we have also invested in more than 30 LNG and CNG fueling operations across 10 U.S. states, with planned additions in several others.

UPS is preparing to meet our continued sustainability challenges by gradually lowering the carbon emissions of some of these trucks even further. For example, in Sacramento, California, we have operated a fleet of CNG trucks since 1991, and now we are able to run those same trucks on very low carbon "renewable natural gas," made by capturing the methane waste from landfills, cleaning it up and putting it in the natural gas pipeline as a "drop-in" fuel for those natural gas vehicles. The fuel works perfectly well, giving UPS a transition strategy to gradually move our natural gas fleet into a low carbon future. Innovative solutions like this offer great promise for the transportation industry as it paves the way toward a more sustainable future.

The NAM Perspective

Competitive Advantage

The rapid increase in domestic natural gas production continues to reshape the U.S. economy and redefine America's competitive advantages within the global economy, especially within the manufacturing sector. According to IHS, "Lower gas and electricity prices serve to directly reduce the energy costs of households and businesses. Going forward, consumers have greater purchasing power and higher confidence, businesses experience higher profits, and **domestic manufacturers are more cost-competitive relative to their international competitors as a result of lower natural gas prices.**"

Money in Your Pocket

The U.S. economy also enjoys reductions in inflation and unemployment as a result of technologies that unlock shale gas. Taking last year as an example, Americans saw significant gains. IHS estimates that **as a result of the increase in domestic shale gas production, we saw real GDP increase by \$190 billion and 1.4 million more jobs.** Shale gas meant more than \$150 billion more dollars in real disposable income last year. That means the average American family had an extra \$1,337 in disposable income.

Manufacturing Opportunity

Because manufacturing relies on both natural gas and electricity, lower natural gas prices not only reduce the cost of purchasing natural gas for fuel, but manufacturers also see an indirect reduction in costs through the use of less expensive electricity. The combination of **increased access to shale gas and the pipelines that deliver that**

affordable energy to manufacturers across America meant 1.9 million jobs in 2015 alone. As our pipeline network grows, so does manufacturing opportunity.

Multiplier Effect

Pipeline construction means more than just reliability and energy security. It generates increases in economic activity when inputs like steel pipe, coatings, construction equipment, compressor motors, gauges and instruments, sand and gravel, or engineering and design services. And when workers spend disposable income, there is a multiplier effect to the broader economy. In a nutshell, **the construction of new natural gas transmission lines meant more than 347,000 jobs in 2015, with almost 60,000 of those in manufacturing.** When you also consider the ongoing impacts of operation and maintenance of existing pipelines as well, it adds up to **nearly \$50 billion in GDP.**

Room to Grow

Total natural gas demand is poised to increase by 40 percent over the next decade—double the growth of the past 10 years. And by improving technology and increasing productivity, supply growth continues at a strong pace despite falling prices for both gas and oil and significantly lower rig activity. But according to IHS, "There is a mismatch, geographically, in the growth in natural gas demand and supply in the U.S. lower 48." **New pipeline and processing infrastructure expansion will be a key to connecting new supply sources with new and growing sources of demand.**

"As our pipeline network grows, so does manufacturing opportunity."

Beyond these numbers, the changing dynamics of the global energy market has had profound geopolitical and economic impacts. On the former, a few years ago, it would have been difficult for one to predict a time where growth in energy production would come from North America and not the Middle East. This additional output has pushed energy costs dramatically lower, helping to reduce the cost of production for manufacturers in the United States.

Nowhere is this more evident than in the chemical sector, with at least 262 announced investments in that category in recent years, 61 percent of which has been foreign direct investment. Manufacturing construction has already soared, with more jobs and exports expected to follow. As our pipeline network grows, so does manufacturing opportunity.

Chad Moutray

Chief Economist

Center for Manufacturing Research

National Association of Manufacturers



Connect with Us:



The Economic Benefits of Natural Gas Pipeline Development on the Manufacturing Sector

Prepared for the National Association of Manufacturers

May 2016

Consulting Report

ECR | Private Report

Brendan O'Neil
Managing Director, Consulting

Phil Hopkins
Director, Consulting

Julie Gressley
Research Economist



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CHAPTER ONE: A DESCRIPTION OF THE NATURAL GAS PIPELINE SYSTEM

Introduction and Overview

The rapid increase in domestic natural gas (NG) production continues to reshape the U.S. economy and redefine America's competitive advantages within the global economy, especially within the manufacturing sector. In the continuing effort to understand how a resurgent oil and gas industry impacts broad-based manufacturing, IHS examined how the expansion of NG pipeline infrastructure benefits the U.S. manufacturing sector. Beyond exploration and production companies, many firms across a diverse set of industry sectors are beneficiaries of tens of billions of dollars in capital expenditures and operating and maintenance (O&M) expenditures made annually across the hydrocarbon value chain. Going forward, lower natural gas prices will result in benefits to consumer purchasing power and confidence, higher profits among businesses, and improvements in cost-competitiveness for domestic manufacturers relative to their international competitors. The U.S. economy experienced significant gains in 2015: IHS estimates that economic benefits from increased domestic shale gas production and the accompanying lower NG prices include contributions of \$190 billion to real gross domestic product (GDP), 1.4 million additional jobs, and \$156 billion to real disposable income.

IHS Energy expects that the ongoing development of conventional and unconventional NG plays in the U.S. Lower 48 will keep supply growth steady between 2016 and 2025, enabling it to meet domestic demand. The rapid growth of NG production in some of the major shale plays has created bottlenecks in some parts of the U.S. where there is insufficient transmission pipeline capacity to move the NG to market. IHS estimates that approximately \$25.8 billion was spent in the U.S. in 2015 to construct 6,028 miles of new natural gas transmission pipelines, resulting in a temporary increase in employment of 347,788 jobs, with 59,874 in the manufacturing sector. Similarly, the construction spending is expected to have contributed \$34 billion to GDP and \$21.9 billion to labor income in 2015. This study presents current unit cost estimates, in dollars per mile, for constructing and operating three types of NG pipelines: gathering, transmission, and local distribution. The focus of this study is on the economic impacts of constructing and operating new NG transmission lines, as they are the means by which pipeline-ready NG is transported from the wellhead to local markets; the effects of the other two other types of NG pipelines will also be considered as appropriate.

Well-understood economic contributions are derived from midstream and downstream energy capital and O&M expenditures across a diverse supply chain. Recent IHS analyses on the U.S. 'manufacturing renaissance' identified clear competitive advantages that have emerged for manufacturing in America as a result of the increased supply of competitively priced natural gas. For energy-intensive industries such as chemicals, metals, food, and refining, production costs have been reduced as a result of the increase in natural gas supply, and IHS expects these industries to outperform the U.S. economy as a whole through 2025.

The improved competitive positioning of industries in the manufacturing sector is shaping state and local economic development strategies across the country. Increased supplies of NG, especially at lower delivered prices, enhances the competitiveness of economies by making them more attractive to manufacturing activities that are large, and intensive users of NG such as chemicals, food, paper, and metals. The close proximity of existing clusters of manufacturing establishments to increased NG supplies can generate new pipeline-related economic development, often because of the availability of direct connections to a new or expanded NG pipeline. In a recent IHS manufacturing strategy study for the City of Philadelphia Industrial Development Corporation, core recommendations included expansion of NG pipeline capacity from the Marcellus Shale region to the Greater Philadelphia area as an enabler for expanding the regional manufacturing sector. Recent IHS research indicates that sectors such as food, cement, wood, paper, chemicals, and primary and fabricated metal products will be the largest beneficiaries of increased supplies and lower NG prices, as they both use it intensively (i.e., consume a high number of British Thermal Units (Btu) per unit of output) and require large amounts of it, especially in chemicals subsectors, where it is used as a feedstock. Expansions of NG pipeline capacity are also needed to enable the construction of new NG-fired electric generating plants. In addition to providing key inputs for the construction of NG pipelines, the manufacturing sector will also benefit economically from the capital expenditures for new electric generating plants and for facilities used to process and store NG and natural gas liquids (NGLs).

In a nutshell, the combination of increased access to shale gas and the transmission lines that move that affordable energy to manufacturers across America meant 1.9 million jobs in 2015 alone. In the following sections, IHS will identify the major sources of demand for NG by the manufacturing subsector and describe the key components of the gathering,

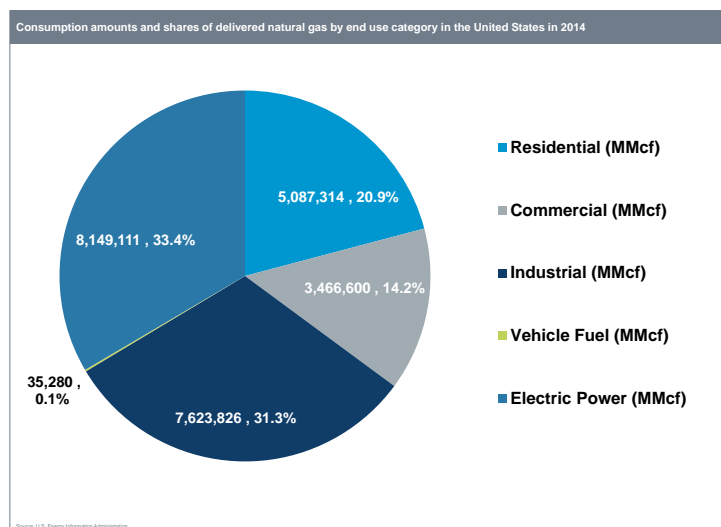
transmission, and distribution system. The focus of this analysis will be on the effects of increased NG supply and the construction and operation of NG transmission pipelines on the manufacturing sector.

Natural Gas Users

According to the U.S. Energy Information Administration (EIA), over 24.4 trillion cubic feet of NG was delivered to consumers in 2014.¹ Natural gas consumption is typically classified into five main categories of end users, as described below.

Electric Power

The electric power sector uses large amounts of NG as a fuel in producing electricity. The electric power sector consumed 8,100,000 million cubic feet (MMcf) of natural gas in 2014, the largest end user share at 34%. In addition, the electric power sector has had the second-highest growth rate in demand for NG among major end-user categories, with a compound annual growth rate (CAGR) of 4.1% from 2004 through 2014.²



Industrial

Many industries use NG as a fuel or a feedstock for production, with approximately 80% of total industrial demand for NG coming from the manufacturing sector. The remaining 20% comes from other industrial activities, such as agriculture, construction and mining.³ Our U.S. Industrial Gas Demand report identified four ways that NG is used by the manufacturing sector:

- As a fuel for direct process uses, such as drying, melting, process cooling and refrigeration
- As a fuel for direct non-process uses in manufacturing establishments, such as heating, ventilation, and air conditioning (HVAC), lighting, and other uses
- As a fuel for indirect purposes, primarily in boilers that are used to produce electricity and steam
- As a feedstock, with almost 93% occurring in the petroleum refining, chemical, and primary metals sectors

The three fuel uses account for 91% of total demand for NG by the manufacturing sector, while the remaining 9% is for feedstock.

Industrial end users of NG are the second-largest consumers of natural gas, using 7.6 million MMcf in 2014. The industrial sector accounted for 31% of consumption of delivered NG in the US in 2014. Growth in industrial use of NG has been slower than most other end-use categories, with a CAGR of 0.5% from 2004 through 2014. Industrial gas consumption had declined over two decades as a result of increasing energy efficiency, high gas prices in the years before the shale gas revolution, and slow growth in industrial production for the most gas-intensive industries, many of which were hit hard by the Great Recession,⁴ but are currently showing signs of stabilization.

¹ U.S. Energy Information Administration. "Natural Gas Consumption by End Use." Accessed July 2015. http://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm.

² U.S. Energy Information Administration. Total consumption. 30 June 2015 release.

³ IHS CERA, March 2014, U.S. Industrial Gas Demand. mil

⁴ IHS CERA *Fueling the Future with Natural Gas: Bringing It Home*, page VII-1.

Residential

Residential consumption of NG natural gas typically includes household uses, such as heating, cooling, cooking, and other similar activities. Residential consumption growth is relatively slow, at CAGR of 0.5% from 2004 through 2014, to 5 million MMcf. While there has been a 31% increase in residential customers served between 1990 and 2011, residential gas customers reduced their consumption of gas by approximately 1.2% a year, in part, through the use of more energy-efficient homes and appliances. When normalized for weather, NG consumption has been relatively flat in that time period.⁵

Commercial

Commercial businesses use NG for non-manufacturing purposes, such as for heating, cooling, and so on. Typical commercial users include leisure sectors, wholesale and retail trade, and government agencies. Commercial consumption of NG is relatively low, as compared with other end users, at around 3.5 MMcf in 2014, and growing at a CAGR of 1% from 2004 through 2014.

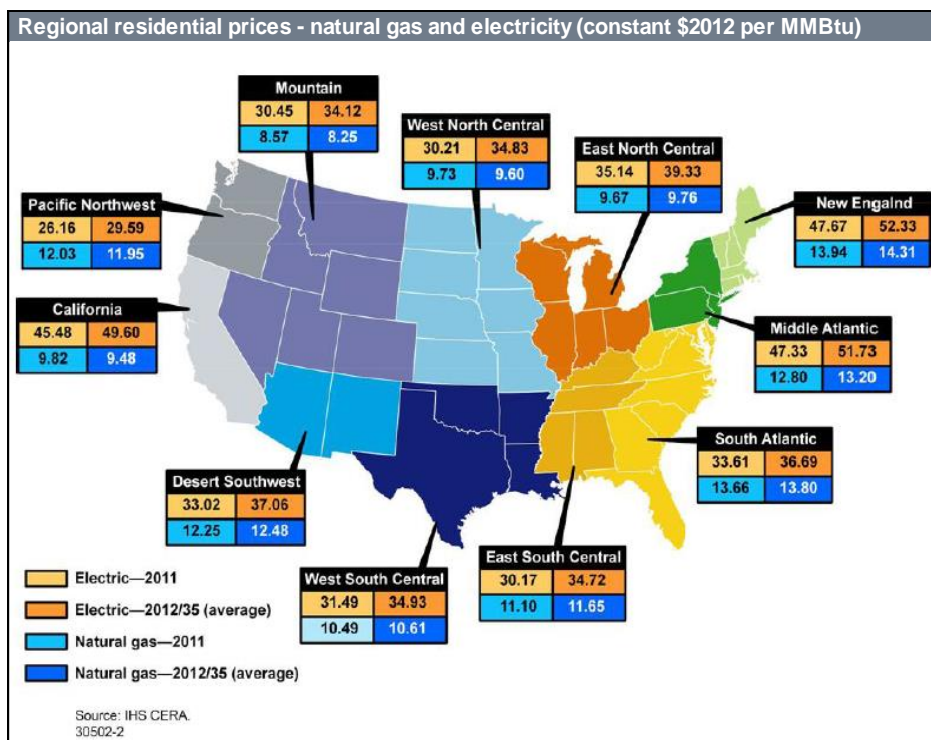
Recently, vehicles powered by NG have increased in popularity. While use as a vehicle fuel is a small proportion of overall consumption, about 0.1% of total delivered NG consumption in 2013 and 2014, it is the fastest growing consumer of natural gas, with a compound annual growth rate (CAGR) of 4.8% from 2004 through 2014. On-road vehicles account for 79% of total demand for transportation fuels.⁶ Given recent declines in the price of NG fuels, there is significant growth potential in natural gas vehicles.

The Natural Gas Pipeline System

The on-shore NG pipeline system is a complex network that transports NG from the wellhead to the end user, and in 2014, it was composed of over 1.52 million miles of pipeline⁷ that are located in every state in the country. The NG pipeline system is composed of three major subsystems:

- Gathering pipelines
- Transmission pipelines
- Distribution pipelines

Each of the three pipeline segments performs different functions in the NG system and has varying requirements for materials, construction, and operations. In this section, we will describe the NG logistics system, which includes major pipelines segments, facilities, and basic components that are required on those segments and their relative size in mileage.



⁵ IHS CERA *Fueling the Future with Natural Gas: Bringing It Home*, page 81.

⁶ IHS CERA *Fueling the Future with Natural Gas: Bringing It Home*, page 209.

⁷ Mileage includes pipelines that are active, inactive/idle, and temporarily abandoned.

The largest clusters of natural gas pipeline are located in natural gas production areas the South, which includes pipeline from NG-rich Texas, Louisiana, and the Gulf Coast. Pennsylvania, Wyoming, Oklahoma, and Colorado also have significant clustering of natural gas pipeline systems. The rise of unconventional technologies has expanded the U.S. production base sufficiently that domestic gas resource production could supply current U.S. consumption for 88 to 154 years.⁸

According to the U.S. Department of Transportation,⁹ in 2014 the length of on-shore natural gas pipeline system was 1,573,477 miles and comprised the following components:

- Gathering pipelines: 11,390 miles in 26 states, 0.7% of the total
- Transmission pipelines: 297,800 miles in 50 states, none in the District of Columbia, 18.9% of the total
- Distribution pipelines: 1,264,287 miles in all 50 states and the District of Columbia, 80.4% of the total

Natural Gas Gathering Pipelines

The gathering pipeline system is the first step in the NG delivery system, linking together small branches of pipeline to push NG collected from the wells in the NG and oil fields into larger pipelines to move NG through the system. The gathering pipeline systems is composed of small, low-pressure pipelines that sometimes travel through multiple leaseholder fields and occasionally require the help of compressors to generate additional pressure to push the NG on its way. Operating pressure in gathering pipeline systems varies considerably based upon pressure produced from wells. The first stop in the gathering pipeline system is a leasing facility, where the volume of NG is metered, or measured, to assess royalties owed to leaseholders.

Typically, when NG is pumped from the ground, it contains constituents that could damage the pipeline system that must be removed before it can be put into a transmission line (i.e., pipeline-ready NG). Each pipeline has a rating for the quality of NG, pressure, and quantity it can handle. Gathering pipeline systems are smaller in diameter, as they handle smaller quantities of NG. Gathering pipeline systems are located mainly in NG-producing states. There were 11,390 miles of gathering pipelines in the United States in 2014 with about 56% of the total in Texas, Louisiana, and Oklahoma; however, more gathering pipe is being installed in Pennsylvania, Ohio, Colorado, and West Virginia.

Natural Gas Gross Well Withdrawals by State, 2013 (MMcf)

State	2013
Alabama	271,986
Alaska	3,215,358
Arizona	72
Arkansas	1,139,654
California	252,310
Colorado	1,604,860
Florida	18,011
Illinois	2,887
Indiana	7,938
Kansas	292,467
Kentucky	94,665
Louisiana	2,413,575
Maryland	32
Michigan	123,622
Mississippi	413,329
Missouri	-
Montana	63,242
Nebraska	1,032
Nevada	3
New Mexico	1,271,185
New York	23,458
North Dakota	345,787
Ohio	186,181
Oklahoma	2,143,999
Oregon	770
Pennsylvania	3,259,042
South Dakota	16,205
Tennessee	5,400
Texas	8,211,255
Utah	470,863
Virginia	139,382
West Virginia	717,892
Wyoming	2,047,757

U.S. Natural Gas Gross Withdrawals (MMcf)	30,005,254
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Source: EIA

Natural Gas Processing Plants

Natural gas processing facilities are the next point in the system, where impurities and marketable gas and liquids by-products are separated, based on future pipeline standards for these materials. Natural gas, especially “wet” gas, often has

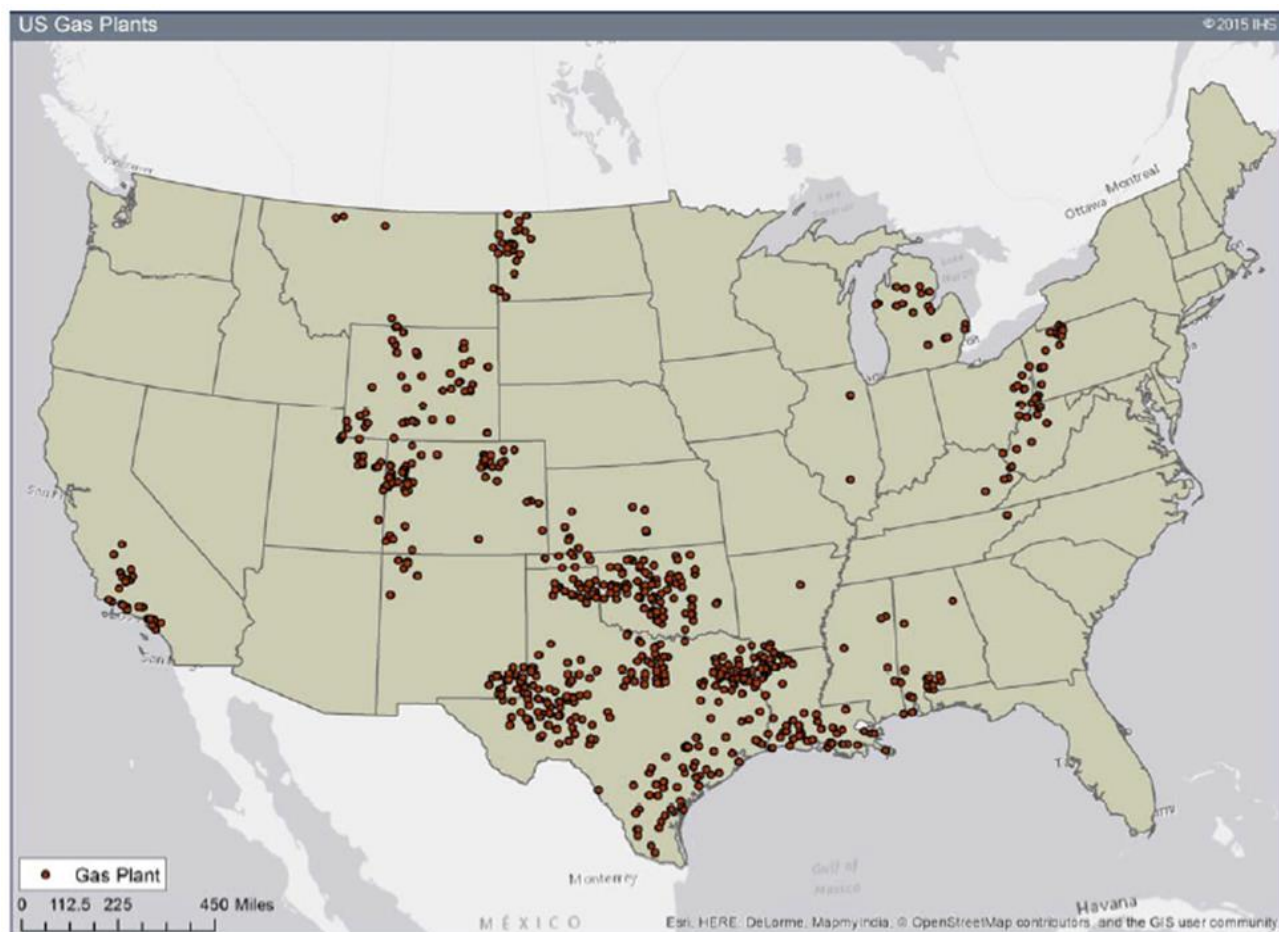
⁸ IHS CERA *Fueling the Future with Natural Gas: Bringing It Home*, page ES-5.

⁹ U.S. Department of Transportation, Pipeline and Hazardous Materials and Safety Administration.

<http://phmsa.dot.gov/portal/site/PHMSA/menuitem.6f23687cf7b00b0f22e4c6962d9c8789/?vgnextoid=a872dfa122a1d110VgnVCM1000009ed07898RCRD&vgnnextchannel=3430fb649a2dc110VgnVCM1000009ed07898RCRD&vgnnextfmt=print>

valuable by-products that are processed and resold. Primarily, the various types of NG liquids (NGL themselves have a variety of uses, including as petrochemical feedstock (e.g., ethane, butane, and isobutene) and fuel (e.g., propane).

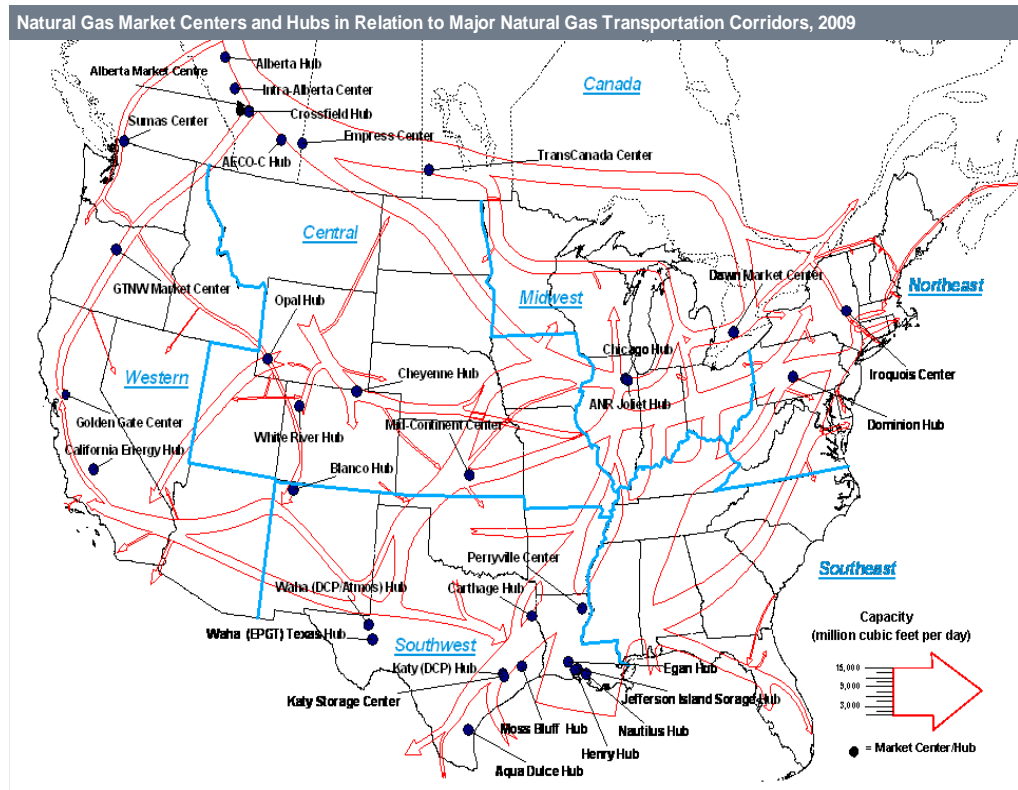
Other by-products of NG processing that may be extracted and sold include: sulphur, carbon dioxide, nitrogen, and condensate (heavier liquids). Compressors then help push NG toward transmission line inlets. According to IHS,¹⁰ as of June 2015, there were a total 728 operating NG processing plants in the United States, with a combined capacity of 83,955 million cubic feet per day (MMcf/d). The accompanying map shows the current spatial distribution of gas processing plants in the United States. The map clearly shows they are located in the major gas-producing formations in the United States, such as the Marcellus in western Pennsylvania, the Bakken in western North Dakota, and the formations concentrated in Louisiana, Oklahoma, and Texas. Some of the plants along the Louisiana and Texas coasts also process NG produced off shore in the Gulf of Mexico.



¹⁰ IHS Energy, June 2015. Second Quarter – North American NGL Markets Infrastructure Update.

Natural Gas Transmission Pipelines

The transmission pipeline system is composed of much larger pipelines that move NG within (intrastate) and across (interstate) states. Typically, interstate lines are owned by large holding companies. Transmission lines are constructed of high-strength steel that is 0.25 to 0.75 inches thick and typically range from 20 to 42 inches in diameter. The transmission system can operate at a pressure of 200 to 1,500 pounds per square inch (psi),¹¹ based on the maximum allowable operating pressure rating of the pipe. The pipelines are also coated with epoxy to protect them from corrosion. The volume of NG and its speed of movement, up to 30 miles per hour through the transmission system depend upon the diameter of the pipe and its pressure, which is dictated by several factors: 1) ambient conditions, such as elevation and temperature; 2) proximity to compressor stations; and 3) the amount of pressure generated by the compressor station. As NG moves along the transmission lines, it generates friction, and as pressure falls, NG speeds slow down. Generally, compressor stations are located between 50 to 100 miles apart¹² on transmission lines, but in regions where NG must move through large elevation changes and/or temperature changes, they are located closer together to give NG a boost. Compressor stations typically also contain filtering and scrubbing systems to capture any contaminants that the NG may have picked up along its journey.



Compressors: A compressor is a machine driven by an internal combustion engine or turbine that creates pressure to “push” the gas through the lines

Condensate: A gas that becomes a liquid when exposed to atmospheric pressure

Supervisory Control and Data Acquisition (SCADA): Systems that monitor transmission pipelines automatically, transmitting data on pipeline operation points, such as volume, pressure, and temperature

Given the importance of NG pressure and volume within the transmission pipeline, valves, safety monitoring systems, and pipeline redundancy around compressor stations are crucial to the transmission system. Control centers and operators constantly monitor and adjust the pressure and volume in lines. Valves that can be operated remotely are used to shut off the flow of NG to pipelines that are undergoing maintenance or have been flagged for safety reasons.

Natural gas moving through the transmission pipeline system generally follows 11 distinct transportation route corridors, from producing regions to consumer regions. Five major routes originate from the Texas/Louisiana/Gulf Coast area,

¹¹ American Gas Association website. Accessed July 2015. < <https://www.aga.org/how-does-natural-gas-delivery-system-work> >

¹² Shively, B. and Ferrare, J. “Understanding Today’s Natural Gas Business.” Enerdynamics Corps. 2007

four originate from Canada, and two originate from the Rocky Mountain area. On these routes, there are multiple points, referred to as hubs/market centers, where transmission pipelines intersect. Hubs provide services such as wheeling between pipelines, exchanges, title transfers, price discovery, electronic trading, parking (temporary storage), and lending. Distribution hubs are privately owned and are often used as price points for trading and contracts. Large end-user clients will often purchase titles for NG, as well as futures from hubs, which will be delivered through the transmission and distribution systems.

The end point of the transmission line is located at the city gate, also referred to as the gate station, where transmission mainlines meet the local distribution system, and is typically operated by the local distribution company (LDC). Most NG end users are located past the city gate, on the distribution pipeline system. Almost all residential and commercial gas users rely on gas LDCs for their gas purchases and/or deliveries.¹³

Few power utilities and industrial manufacturers, that consume a large volume of NG, will be located along the main transmission. Smaller transmission line pipe offshoots of 6- to 16-inch-diameter pipe provide service to local distribution companies or directly to large end-user customers.¹⁴ The frequency in which end-user clients are located along transmission lines, rather than along the distribution lines, is regional in nature.

Storage Facilities

Transmission lines move NG away from the gathering lines, toward end users that receive their gas via local distribution systems. A number of NG demand factors, which will be described in Chapter Two, determine where and when NG is in demand. Surplus NG will be sent to storage facilities. Cost-efficient availability of storage and inventory near the consumer play a significant role in NG pricing. Geographic circumstances, pipeline availability, and demand fluctuation affect the kind of storage that is available and the potential inventory flow.

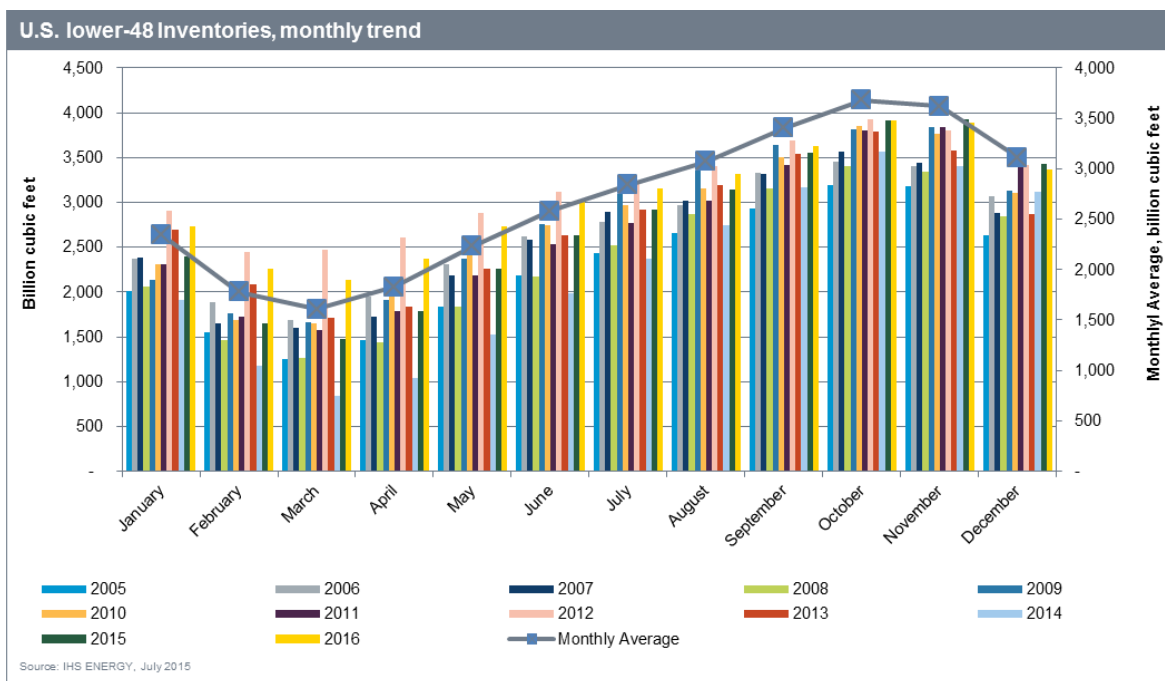
Underground storage facilities are used for longer-term storage, and there are three main types that may be located near the production region or the end-user region:

- Depleted NG or oil fields, which are typically located either in producing regions or in formally producing regions that are closer to consumption areas. Depleted fields are optimal storage locations, as much of the necessary infrastructure for withdrawal is already in place, keeping conversion costs low. Additionally, they account for more than 80% of capacity.
- Salt caverns, which are located primarily in Gulf Coast states, but also in the Northeast, Midwest, and Southwest, allow for high rates of withdrawal and injection, but the conversion costs are higher than depleted field conversion.
- Saline aquifers, which are also located primarily in the Midwest, can be suitable for underground storage, based on their geological qualities. Converted aquifers require a larger “cushion” of gas and greater monitoring of performance to maintain safe injection and withdrawal performance.

Monthly underground storage, including inventories, withdrawals, and injections, are monitored and reported by the EIA on a monthly basis. According to EIA, there are approximately 400 active underground storage facilities in the Lower 48 states with inventories that fluctuate on a monthly basis, following seasonal patterns for heating and cooling.

¹³ IHS CERA *Fueling the Future with Natural Gas: Bringing It Home*, page 79.

¹⁴ Shively, B. and Ferrare, J. “Understanding Today’s Natural Gas Business.” Enerdynamics Corps. 2007.



Natural Gas Distribution Pipelines

The distribution pipeline system is the final pipeline system in the delivery system from wellhead to consumer. Local distribution companies deliver gas supply within market areas to customers using 1,264,287 miles of smaller-diameter, low-pressure mains and approximately 880,000 miles of customer service lines that deliver gas from a street connection to the customer's meter.¹⁵ Distribution pipelines are smaller than transmission pipelines, ranging from 24 inches to 2 inches in diameter. Pressure ranges from 60 psi, in pipelines located nearest to the transmission line, to 0.25 psi near, near homes and small businesses. The distribution system consists of pipes (mains and lines), small compressors, regulators to reduce pressure, valves to control flow, metering to measure the flow, and supervisory, control, and data acquisition systems (SCADA) to monitor and remotely control flow. Older distribution lines have been made of various types of material, but newer distribution lines are often constructed with PVC piping, which is less corrosive than metals.

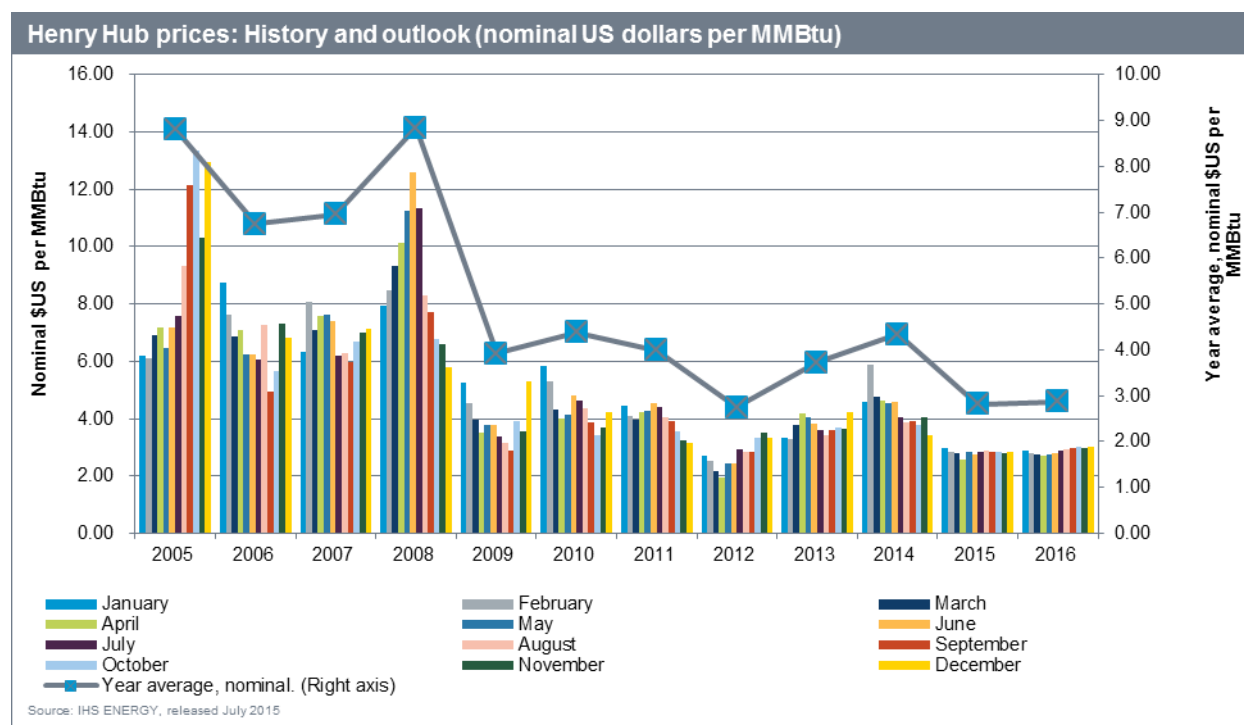
As NG flows through the city gate from the transmission line, interconnects (local distribution companies or local utilities) meter the gas, regulate the pressure (depressurize), and scrub and filter the gas to ensure it is clean and free of water vapor. Natural gas is odorless until mercaptan, the familiar rotten-egg-smelling odorant, is added as an additional safety measure at this point. Local distribution companies or local utilities transport and distribute NG from this point onward to end users. Industries and commercial machinery operators often require higher pressure to operate, and regulators along the distribution system are used to adjust pressure to meet end users' needs. Large end users often hold title to their own gas through market transactions and pay local distribution companies for transportation services. Gas LDCs serve more than 65 million residential customers, more than 5 million commercial customers, and more than 190,000 industrial and power-generation customers.¹⁶ The local NG distribution system is very complex, with service areas ranging from very large to quite small.

¹⁵ American Gas Foundation "Gas Distribution Infrastructure: Pipeline Replacement and Upgrades," page 1.

¹⁶ IHS CERA *Fueling the Future with Natural Gas: Bringing It Home*, page 79.

Natural Gas Liquids (NGLs) and Liquefied Petroleum Gas (LPG) Pipelines

NGLs are produced primarily by NG processing plants and usually contain some or all of the following five types of liquids: ethane, butane, isobutene, propane, and pentane. About 71% of NGLs in the United States are produced by NG processing, the remaining 29% are generated during refining, consisting primarily of propane and butane, and a small volume of ethane. According to IHS, only about 60% of U.S. natural gas production requires processing; the rest is too dry (i.e., low liquid content). The shale plays with the wettest NG are the largest sources of NG liquids, including the Eagle Ford in Texas, and the Utica and Marcellus formations in western Pennsylvania, southeast Ohio, and West Virginia.



IHS estimates that total production of NGLs in the United States in 2014 averaged just over 3.7 million barrels per day. (mmb/d). The seasonal fluctuation in production levels is clearly evident. The production and transportation of NGLs requires the use of NGL storage facilities. IHS recently estimated that the major companies involved in NGL production and transportation currently have a total NGL storage capacity of 328.5 million barrels. Liquefied petroleum gas (LPG) is produced from crude oil refining or NG processing. It consists primarily of propane, normal butane, and isobutene, and current definitions exclude ethane and olefins. According to the U.S. Department of Energy,¹⁷ LPG can be liquefied through pressurization (without requiring cryogenic refrigeration) for convenience of transportation or storage. Both NGLs and LPG are sent via pipelines from processing location, which are usually located in or adjacent to the major NG fields, to locations where they can be processed into other products. According to IHS,¹⁸ there are currently 66,443 miles of NGL pipelines in the United States operated by major companies with a combined capacity of 14,757,802 barrels per day (b/d).

NGLs and LPG Marine Terminals

Marine terminals are used to transfer NGLs and LPG from land transportation modes, such as pipelines and rail, to ships for export or the reverse when they are imported. The map below shows the location of the currently operating LPG marine terminals in the United States.

¹⁷ U.S. Department of Energy, Energy Information Administration, July 2015. Glossary. <http://www.eia.gov/tools/glossary/index.cfm?id=L>.

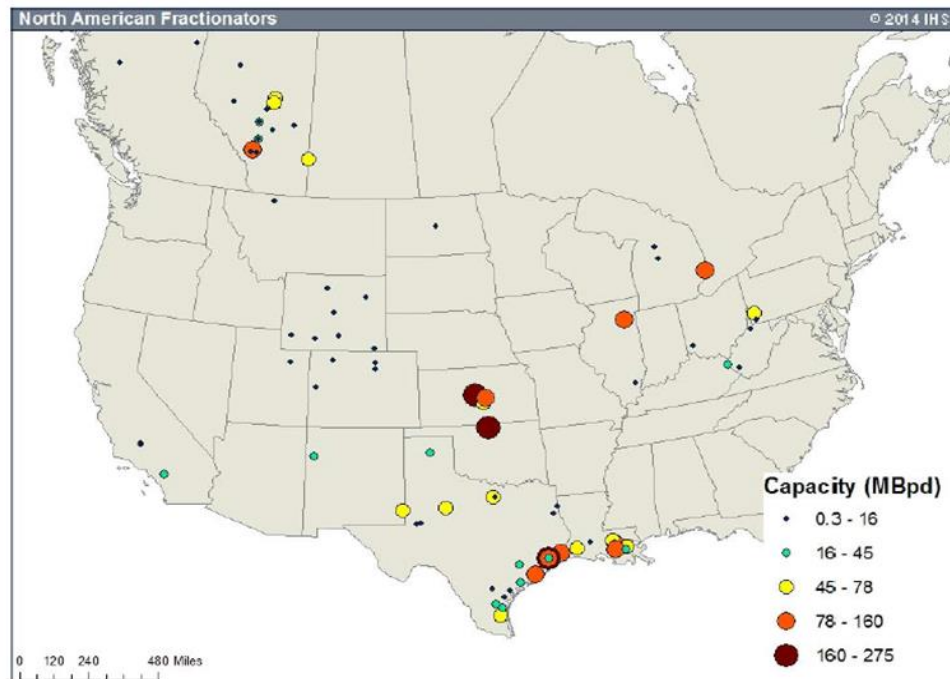
¹⁸ IHS Energy, June 2015. Second Quarter – North American NG Markets Infrastructure Update



Natural Gas Fractionators

Natural gas liquids fractionation facilities process NGLs into other products that are then used as inputs into petrochemical productions. For example, a fractionator may use several different processes to separate ethane from the NGL stream. According to IHS,¹⁹ in 2013 there were a total of 93 NGL fractionators located in the United States with a combined processing capacity of 4,423 thousand barrels per day (mbd). The map below shows the spatial distribution and capacities of the major clusters of NG fractionators in the United States and Canada. While fractionators are usually located in major NG producing regions, they can also be located at the end of pipelines carrying NGLs and LPG, for example. Sunoco Logistics has recently started construction of a 35,000 bpd fractionation plant at its Marcus Hook Industrial Complex, located on the Delaware River about 25 miles south of Philadelphia.

¹⁹ IHS Energy, June 2015. Second Quarter – North American NGL Markets Infrastructure Update.



Liquefied Natural Gas Facilities

Liquefied natural gas (LNG) is produced by cooling to a temperature of approximately -260 degrees Fahrenheit. The primary reasons for liquefying NG are to store it for future use (i.e., in a peak shaving facility) and re-gasifying it when it is needed and putting it back into a pipeline to transport it, such as in an LNG tanker, or for direct use, such as a fuel in NG vehicles. Natural gas in liquid form takes up about 1/600th of its volume when in gaseous form. The major types of LNG facilities include:

- Liquefaction plants that convert pipeline ready gas to liquid form prior to storage, transport, or other use.
- Regasification facilities.
- Storage facilities, including peak shaving plants.
- Marine terminals through which LNG can be either exported or imported.

As described by the Department of Energy,²⁰ LNGs can be liquefied through pressurization (without requiring cryogenic refrigeration) for convenience of transportation or storage. Both NGLs and LNG are sent via pipelines from processing locations, which are usually located in or adjacent to the major NG fields, to locations where they can be processed into other products. According to IHS,²¹ there are currently 66,443 miles of NGL pipelines in the United States operated by major companies with a combined capacity of 14,757,802 b/d.

According to the Federal Energy Regulatory Commission (FERC),²² there are currently 11 operating LNG export/import terminals in the United States with a combined capacity of 18.5 billion cubic feet per day (Bcf/d). All of them are located along the Atlantic Ocean and Gulf of Mexico coasts, with 12.9 Bcf/d of capacity present along the Gulf of Mexico coast.

Peak shaving facilities store LNG and re-gasify it to meet peak demands for NG. According to FERC, there are 13 peak shaving plants located in the United States, primarily in the Middle Atlantic and Northeast states. The role of supply and demand in NG availability and pricing are described in the next chapter.

²⁰ U.S. Department of Energy, Energy Information Administration, July 2015. Glossary. <http://www.eia.gov/tools/glossary/index.cfm?id=L>

²¹ IHS Energy, June 2015. Second Quarter – North American NG Markets Infrastructure Update.

²² Federal Energy Regulatory Commission, July 2015. <http://www.ferc.gov/industries/gas/indus-act/lng/lng-existing.pdf>.

CHAPTER TWO: DRIVERS OF PIPELINE GROWTH – NATURAL GAS SUPPLY AND DEMAND

The NG resource base in North America is plentiful and low cost. A geological assessment of 17 unconventional NG plays in North America published by IHS Energy in 2010 indicated that many years of growing gas demand could be supplied at a breakeven wellhead price of \$3.75 to 4.50/btu. Recent technological advances and price moves suggest that the reserve base is even larger and the current break-even prices are even lower.

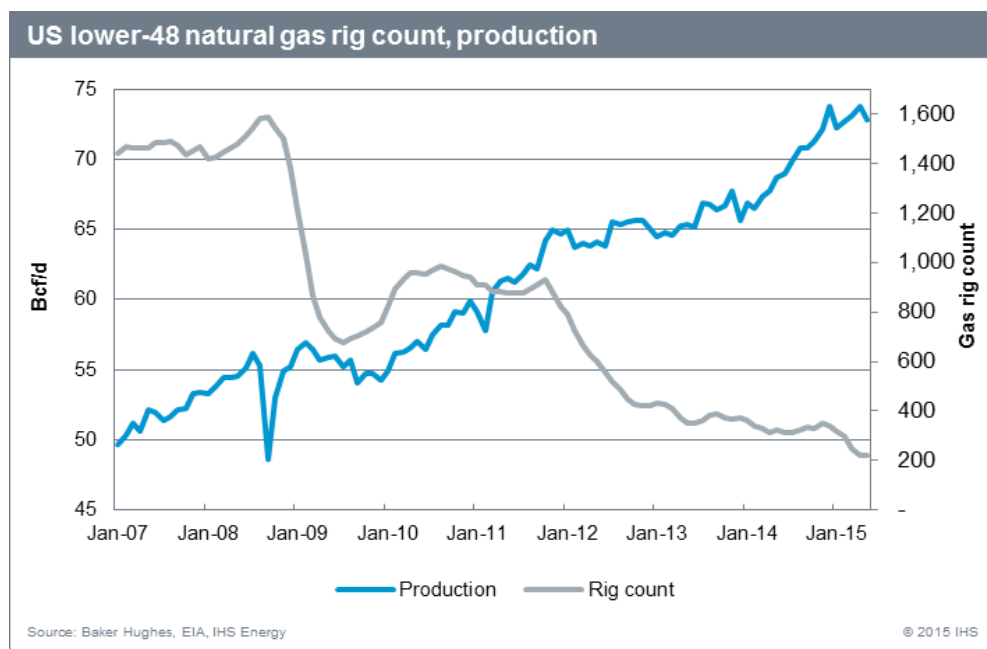
Nevertheless, supply does not generally grow at a steady rate. Investment decisions are made in consideration of the prevailing and expected market environment. There is often a lag of several months, as rigs are hired and wells are drilled, completed, and hooked up to gathering lines and other infrastructure before new production begins to flow. As a result, supply responds to market changes with a lag. Operators' responses to price changes will be further delayed if they have placed corporate hedges against adverse changes in the market.

*The unexpected growth of Appalachian production
has upended traditional gas flows
and created new infrastructure needs.*

Supply Growth

Supply growth continues at a strong pace, despite obstacles. With the widespread adoption of unconventional gas production techniques, the U.S. Lower 48 gas resource base has become a juggernaut of supply growth.²³ Between 2007 and 2014 U.S. Lower 48 gas production grew by approximately 2.5 billion cubic feet per day (Bcfd), or 4% of total production, every year.²⁴ In one 12-month period ending December 2011, production grew by about 5.6 Bcfd. In 2014, the year-over-year increase was 3.8 Bcfd on an annual average basis.

Growth has persisted despite falling prices for both gas and oil and significantly lower rig activity. The industry has fueled growth, despite these obstacles, by improving drilling and completion technology and increasing productivity in dry gas plays. Additionally, producers have focused their drilling activities on the most productive areas of each play to maximize production and minimize cost.



Rig counts have fallen while production continues to grow. The U.S. Lower 48 gas-directed rig count averaged 332 in 2014, a more than 75% decline since 2008 when there were almost 1,500 gas-directed rigs operating. Gas-directed drilling has declined further in 2015, averaging 250 through July.

²³ U.S. Lower 48 excludes the non-contiguous states of Alaska and Hawaii.

²⁴ In this section, natural gas refers to dry natural gas.

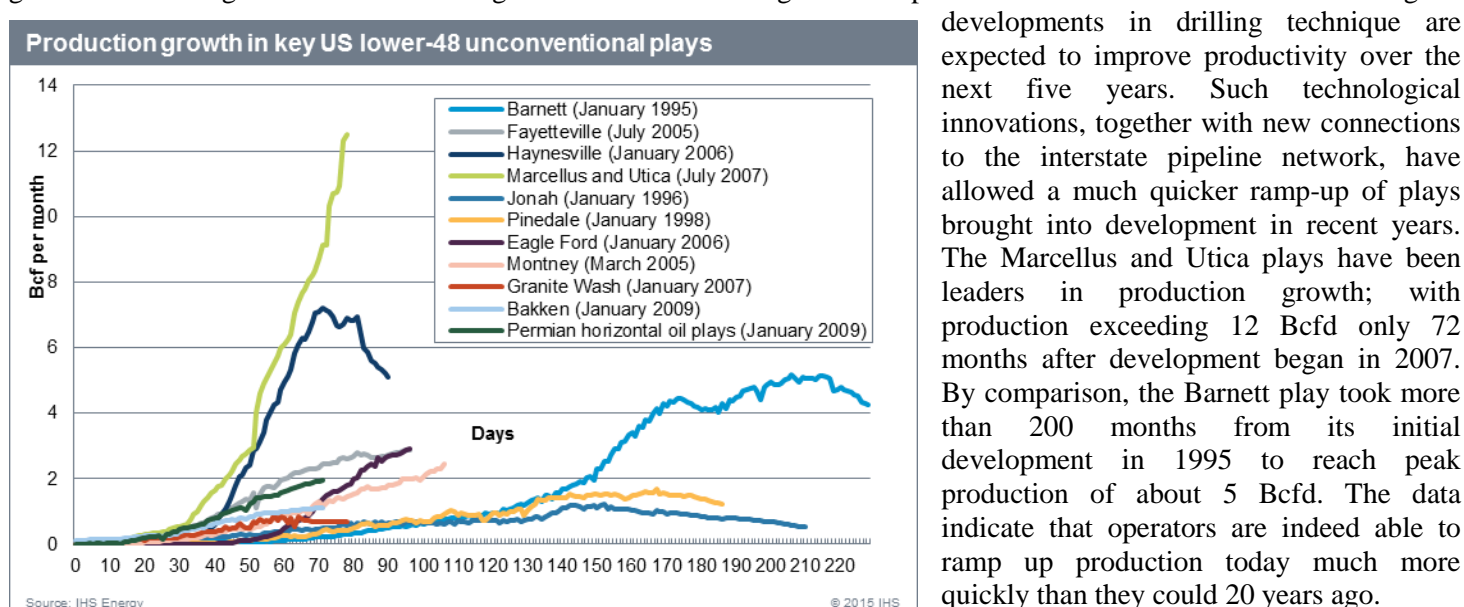
Oil-directed drilling is also a significant contributor to NG production in the U.S. Lower 48 because in many oil plays, NG is intermixed with the oil and gets produced via the same well. While in some cases, where infrastructure does not exist, this gas is burned off in a process called flaring, in most cases, the gas is collected and brought to market on the pipeline system. This is called associated gas, and in 2014 it represented approximately one-fifth of all U.S. Lower 48 NG production. Because gas is produced as a byproduct of oil in these areas, well economics are tied to the price of oil and not gas. As a result, associated gas production depends on the amount of oil-directed drilling that occurs. Oil prices, namely West Texas

Intermediate (WTI) Crude, have fallen dramatically over the past year, from over \$100/bbl in July 2014 to approximately \$46/bbl in October 2015. While the impact on oil-directed drilling did lag behind the fall in oil prices, the oil rig count fell from 1,602 in early October 2014 to 578 by the end of October 2015, a decline of 64 %.

Despite declining drilling activity for both gas and oil, gas production continues to grow as rig efficiency and well productivity both increase. Drillers are focusing on the most productive areas of plays, and rigs are drilling more complex wells with longer horizontal segments and more hydraulic fracturing stages to increase productivity. At the same time, the practice of drilling multiple wells on a single pad along with other innovations has significantly reduced the time required to drill a well. In the Marcellus, for example, average drill days have declined significantly for many operators since 2009, indicating the learning trends among operators in the play.

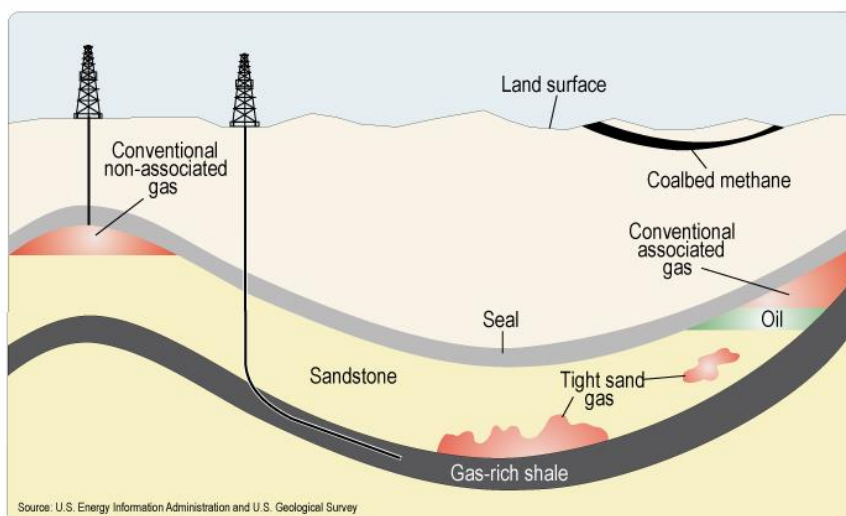
Well Productivity

Well productivity is steadily increasing in many plays. As operators become more familiar with the geological structure of plays and sub-plays, they are able to target the most productive areas for drilling. They are also making steady incremental gains in extending laterals and reducing well costs via drilling and completion efficiencies. Additional technological



developments in drilling technique are expected to improve productivity over the next five years. Such technological innovations, together with new connections to the interstate pipeline network, have allowed a much quicker ramp-up of plays brought into development in recent years. The Marcellus and Utica plays have been leaders in production growth; with production exceeding 12 Bcf per month only 72 months after development began in 2007. By comparison, the Barnett play took more than 200 months from its initial development in 1995 to reach peak production of about 5 Bcf per month. The data indicate that operators are indeed able to ramp up production today much more quickly than they could 20 years ago.

The shift toward liquids-rich plays has reduced gas costs. Revenues from NG liquids (NGLs), which are produced with natural gas, such as ethane, butane, propane, and natural gasoline, defray part or all of total well costs. In many cases, NGL revenues exceed the total cost of the well, and, in such situations, the break-even price of dry gas production can be significantly lower, if not negative.²⁵ For example, using December 2014 NGL prices, NGL revenues in the Marcellus Shale reduce the average break-even price of gas from the play from \$4.13 to \$2.40/thousand cubic feet (Mcf).



The Woodford play dramatically demonstrates the impact that NGL revenues can have on project economics. In that play, break-even prices drop from \$7.85 to \$2.21/Mcf in the gas-directed portion of the play and from \$19.35 to (\$4.50)/Mcf in the oil-directed portion. This means that despite a negative price of (\$4.50)/Mcf, operators in the oil portion of the Woodford would receive a positive 10% return on their projects. In contrast, the dry Haynesville shale play has few liquids, and the difference between the breakeven price with and without NGL revenues is only about \$0.10/Mcf.

Table 1
North American full-cycle "IHS outlook" break-even prices (\$/Mcf)

Play	Without NGL credit	With NGL credit
	2015	2015
Barnett	\$9.13	\$6.31
Cotton Valley	\$5.98	\$4.62
Haynesville Shale	\$3.87	\$3.76
Fayetteville Shale	\$4.29	\$3.98
Jonah	\$6.29	\$4.11
Marcellus Shale	\$4.13	\$2.40
Montney	\$5.79	(\$1.28)
Pinedale	\$4.60	\$3.32
Utica Gas	\$5.96	\$3.48
Woodford	\$11.52	\$0.07
Woodford Gas	\$7.85	\$2.21
Woodford Oil	\$19.34	(\$4.50)

Source: IHS Energy

Note 1: Full-cycle unit break-even prices are calculated at the play level for the "typical" gas well and include leasehold, F&D, royalty, opex, taxes, and return. Capital costs are success-weighted and based on equipment needed for the "typical" well. WACC is assumed to be 10%. Taxes are based on tax benefits available to all producers. Well useful life is assumed to be 20 years. Costs shown here do not include transportation costs to Henry Hub.

Note 2: Reflects IHS Energy's first quarter 2014 price outlooks for crude oil and NGLs.

Note 3: Negative numbers indicates a negative gas price is required to reduce the return to 10%, given that the liquids revenues produce a much higher return.

Note 4: Break-even prices for Woodford are shown both at a play level and subplay level to demonstrate how play economics can vary within a play.

Source: IHS Energy

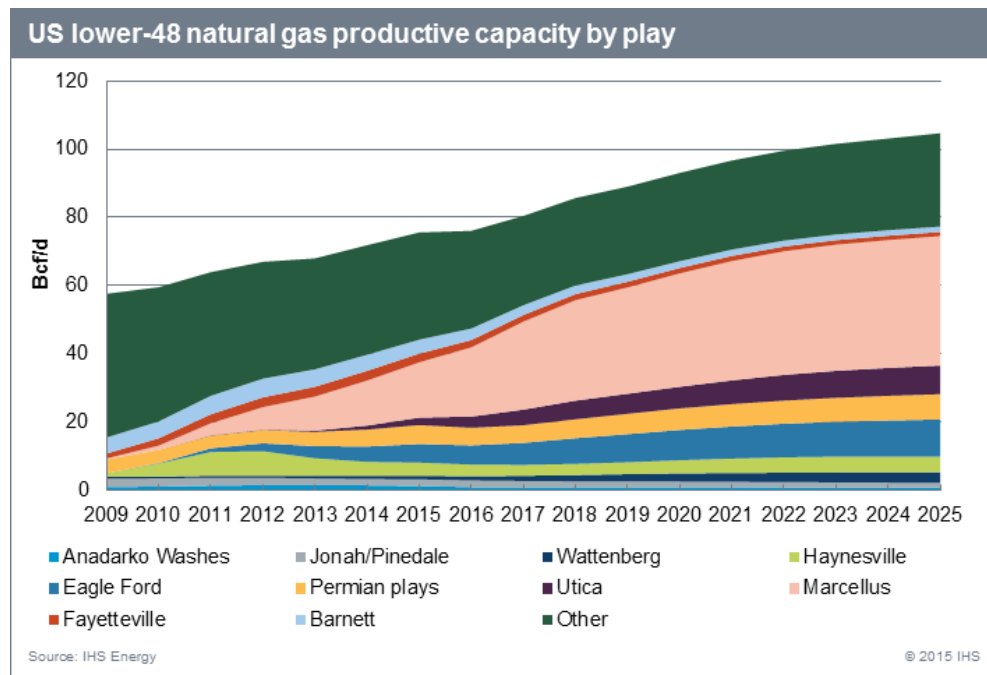
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Production growth is likely to be concentrated in Appalachia, but Texas and Louisiana will grow as well. Unconventional gas activity is concentrated in five major regions throughout North America: Western Canada, the Rocky Mountains, the Permian and San Juan basins in West Texas and New Mexico, the Texas Gulf Coast, and Appalachia. Most of the recent growth, as well as projected development, have been centered in the Appalachian region of the Eastern United States, where gas activity had been sparse prior to 2007. The unexpected growth of Appalachian production has upended traditional gas flows and created new infrastructure needs.

Over the past two years, the Marcellus play has been the most prolific contributor to gas supply growth, with gas production from this formation growing by more than 10 Bcfd between 2012 and 2014. Combined with the Utica, the other major Appalachian play, the Marcellus is expected to account for almost 75% of the total growth, or 22.7 Bcfd, in the U.S. Lower-48 productive capacity between 2015 and 2025. The Haynesville play, which has declined in recent years as operators have shifted toward plays with more NGLs, is expected to rebound, driven by demand growth in southern U.S. markets and increasing well productivity within that play. As a result, the Haynesville production will grow by more than 3 Bcfd by

²⁵ The break-even price calculation assumes a 10% internal rate of return (IRR) on investment. Therefore a negative break-even price for gas can be interpreted as indicating an IRR greater than 10%. Alternatively, an operator could pay a customer to take the gas and still generate a 10% rate of return.

2025, or almost 75% higher than 2015 levels. The Eagle Ford Play in Texas, which combines a mixture of oil- and gas-directed drilling, will also see production increase. Outside of the United States, production in Western Canada, which exports significant quantities of gas to the United States via pipeline, will also grow significantly, driven by anticipated LNG exports and the need to replace declining conventional production in the Western Canada Sedimentary Basin. This growth could potentially be constrained by transportation costs on the TransCanada Mainline (Canadian Mainline), the main route for Western Canadian gas to reach U.S. Midwest and Northeast markets, if those rates make gas from Western Canada uncompetitive in destination markets.



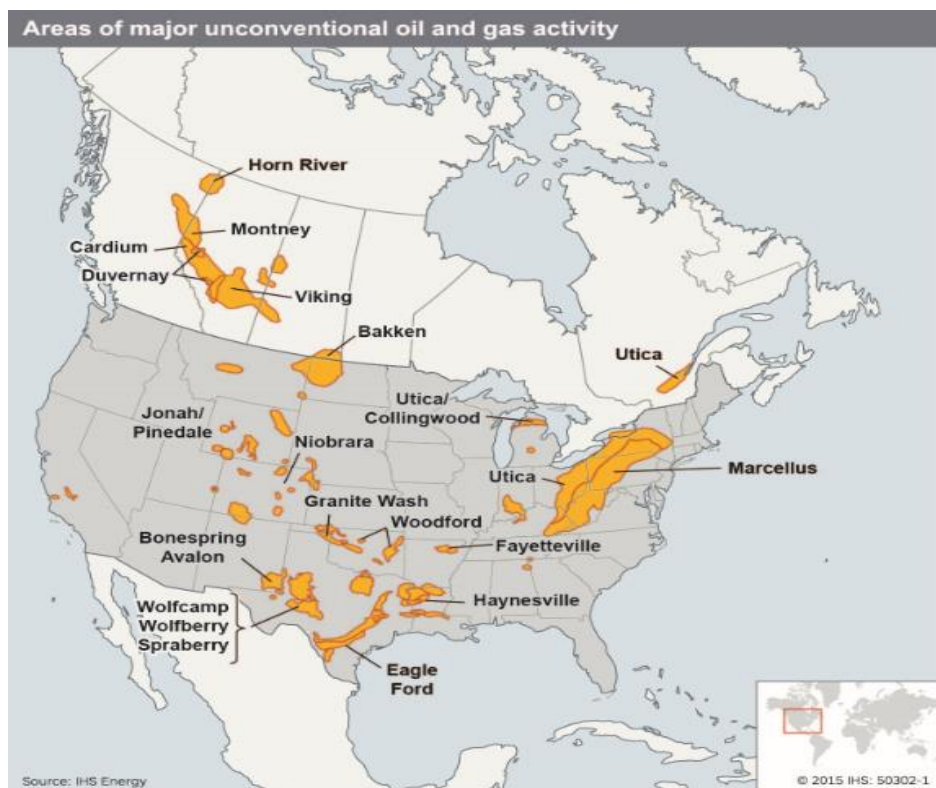
IHS Energy expects that the ongoing development of unconventional gas plays in the U.S. Lower 48 will keep supply growth robust between 2016 and 2025 and will help supply keep up with rapidly growing demand. Our outlook projects an average annual gas production growth of 3.0 Bcfd in the U.S. Lower 48, the majority of which will come from plays in the Appalachian basin. By 2025, total U.S. Lower 48 gas production is expected to reach 102.9 Bcfd, an increase of 33.3 Bcfd, or 48% higher, relative to 2014.

Infrastructure Development

Infrastructure development in the North American pipeline and storage grid over the next 10 years will be driven by producers' choices of how to profit from production growth out of the Marcellus and Utica plays. The rapid growth of low-cost production out of these areas has created a bottleneck, as drillers are unable to find pipeline capacity to move gas from the well to consumer markets. IHS expects new infrastructure development to spread in all directions from Appalachia to support 22.7 Bcfd of productive capacity growth from the Marcellus (19.3 Bcfd) and Utica (3.4 Bcfd) between 2015 and 2025. Producers and shippers have signed up for long-term contracts on pipeline capacity additions to downstream consuming markets totaling about 23.7 Bcfd at this point and representing almost \$30 billion in investment. The majority of new additions are designed to send gas to the U.S. Southeast. 14.6 Bcfd, or 62% of total contracted capacity additions, is heading to the Southeast. 3.5 Bcfd/ (15%), 3.2 Bcfd (13%), and 2.5 Bcfd (10%) are designed to bring Appalachian gas to the U.S. Northeast, U.S. Midwest, and Eastern Canada, respectively.

This investment has already created new flow patterns, as Appalachia has been able to displace other supply regions out of the Northeast markets. The Appalachian production will be forced to gain access to additional new downstream markets, requiring the necessary pipeline capacity to deliver the gas. This is partially possible by re-engineering existing pipelines historically importing gas into the northeastern United States and Eastern Canada to reverse the direction of flow and send low-cost Appalachian gas to additional demand regions. Many pipelines, like the Rockies Express Pipeline, which just reversed its Zone 3 between Illinois and Ohio to carry gas west into the Midwest and Chicago market, are already doing

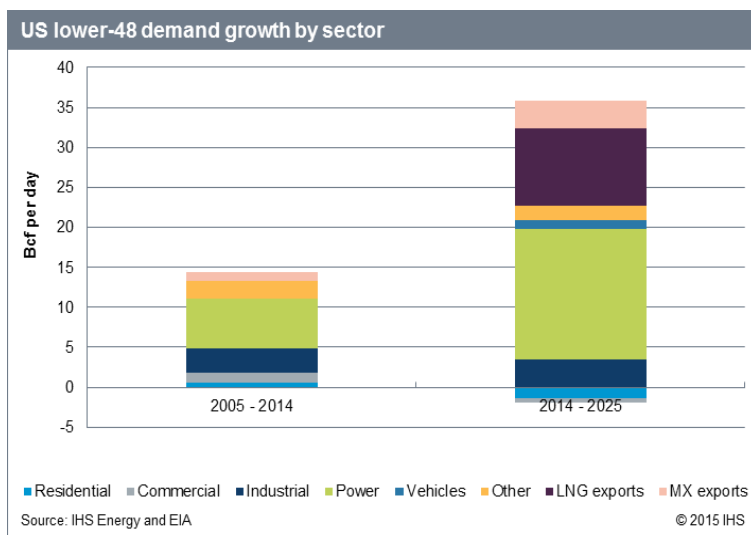
this. As the potential for reversal of existing pipelines is exhausted, the supply growth in Appalachia will require the construction of brand-new pipeline capacity.



Additionally, as U.S. production activity shifts to Appalachia, many pipelines originating in traditional Western and Gulf Coast supply regions are facing increasingly difficult operating conditions. Pipelines out of the Rockies, the Haynesville, the Barnett, and even the Fayetteville may have difficulty renewing long-term contracts that expire later this decade or in the early 2020s. Beyond 2025, the growth in demand for gas-fired power generation will have a significant impact on the pipeline system. This is particularly true if additional pipelines are needed in order to ensure the reliability of electric demand.

Demand Growth

Abundant low-priced NG is driving a massive ongoing and upward shift in NG demand. Low prices together with new environmental regulations are resulting in the retirement of a significant number of coal-fired power plants, many of which will be replaced by gas-fired capacity. Gas-intensive industries, which are identified in Chapter Four, are relocating facilities to North America from overseas, attracted by low prices and abundant supplies of NG and NGL. Domestic trucks, vans, ships, and even locomotives are being built or retrofitted to run on NG. LNG exports are planned from the U.S. Lower 48 and Canada, and U.S. pipeline exports to Mexico are increasing. And all of the growth in NG production will require greater use of NG for field operations and as a pipeline transportation fuel. Total NG demand is poised to increase by 40 percent over the next decade—double the growth of the past 10 years.

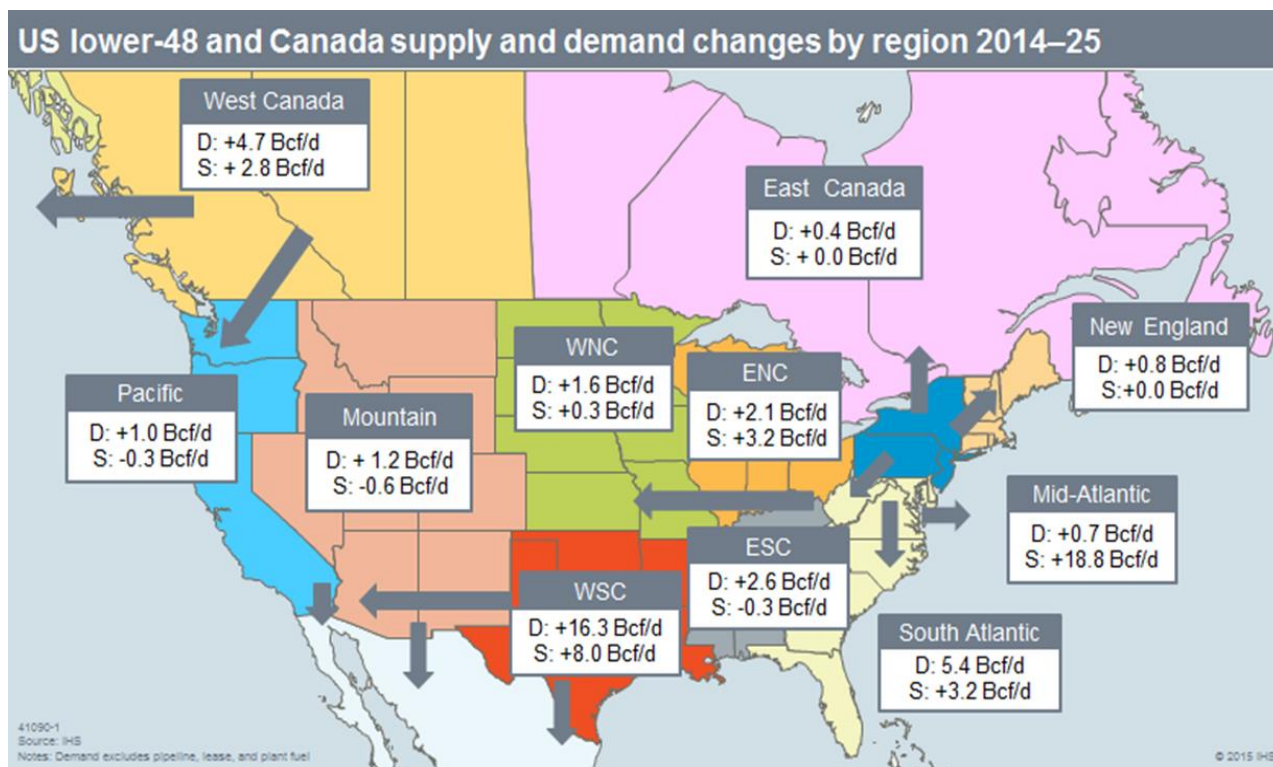


Such demand growth represents a fundamental change for gas producers that for the past 10 years have struggled to find enough markets to sell the production surge accompanying the “shale gale.” Meeting the expected demand growth will require production growth to exceed even the steep increases of recent years. IHS Energy expects that the required supply will become available. Resources are ample, and operators have demonstrated an ability to increase production steadily despite declining prices and rig counts. New pipeline and processing infrastructure expansion will be a key to connecting new supply sources with new and growing sources of demand.

Drivers of New Natural Gas Demand

The power sector will provide the largest growth in gas demand in the next decade. Demand for natural gas in the power sector depends on two major drivers: growth in total electric generation and growth in the gas share of electric generation. With respect to the first driver, the U.S. Lower 48 electricity demand growth averaged 0.9% in the past five years, and electricity demand is projected to increase by an average of 1.6% annually from 2014 to 2025. From a geographic viewpoint, the strongest power sector growth will be in the South Atlantic and Mountain regions, driven by stronger manufacturing output and robust population growth as demographics continue to shift from the cold New England and East North Central (ENC) and West North Central (WNC) to the warmer Southern regions. By contrast, electricity demand growth will be tempered in New England and California, owing largely to expected gains in energy efficiency.

Most of the growth in power-sector demand will be met by increasing amounts of NG-fired generation and also by renewables. IHS Energy expects gas demand for power generation in the U.S. Lower 48 to increase by 73% (16.3 Bcfd) between 2014 and 2025, in comparison to a 39% (6.2 Bcfd) increase between 2005 and 2014. Coal-fired power plants will be retired in response to more stringent environmental regulations and more competitive low gas prices, which will lead to a change in the mix of generation fuel and an increase in NG’s market share. Market-altering environmental regulations include the Environmental Protection Agency’s (EPA) Mercury and Air Toxics Standard (MATS) rule, which took effect in spring 2015, and the Clean Power Plan (CPP), where final rules were finalized in August 2015. Under our reference case, which assumes no CPP, IHS Energy expects a total of 63 gigawatts of coal-fired generation capacity will be retired between 2015 and 2030 while 167 gigawatts of NG-fired generation capacity will be added over the same period.²⁶



²⁶ The CPP effect on natural gas will take some time to ramp up. Most effects of the CPP will occur after 2025 and, therefore, will have little impact within this timeframe.

The ENC, East South Central (ESC), and South Atlantic (SA) census divisions are expected to account for the majority of the net coal capacity retired in North America over this period. Hence, IHS Energy projects these regions will have some of the biggest increases in power-sector gas demand.

The second-largest demand increases are being felt in the U.S. industrial sector, which uses NG as both a fuel and a feedstock to meet a variety of energy requirements. The manufacturing sector accounts for about 80% of total industrial gas demand, with the remaining 20% coming from agriculture, construction, and mining. Within manufacturing, 91% of NG consumption is for fuel (including drying, melting, machine drive, space heating) and the remaining 9% is feedstock use in the refining, chemicals and primary metals sectors. Manufacturing's use of NG is concentrated in a few mature sectors. Chapter Four of this report describes the use of NG in manufacturing, identifying nine sectors at the three-digit North American Industry Classification System (NAICS) code level that accounted for 91.3% of consumption in 2010 as NG-intensive sector. The nine sectors are (in descending order of NG consumption): chemicals, petroleum and coal, food, primary metals, paper, non-metallic minerals, fabricated metals, wood products, and textile mills. The remaining 8.7% is used in 12 subsectors such as: transportation equipment, plastics and rubber products, machinery, computers and electronics, and electrical equipment.

Many of these industries—most notably the chemicals industry—are actively pursuing strategies to take advantage of low NG prices. Standing alone, the chemicals industry is expected to be the third-largest source of growth in gas demand through 2025. IHS has estimated that as much as \$100 billion will be invested between 2013 and 2025 in new chemical, plastics, and related derivative manufacturing facilities in the United States. These investment figures are for manufacturing facilities only; additional infrastructure investment will go hand in hand to support feedstock requirements. IHS Energy estimates that NG demand in the chemical industry will grow by about 40% between 2014 and 2020.

Despite the advantages of lower NG prices, NG demand in most industries is a derived demand, depending on the level of output of the industry in question. Except for a few select industrial segments, such as ammonia and methanol, which use NG as their primary feedstock, gas expenses are only a small fraction of the total cost base when it is being used as a fuel. An expanding industry is likely to increase its demand for NG, regardless of the level of gas costs, more readily than an industry that is not expanding. Therefore, the growth prospects of the major gas-consuming industries are an important indicator of future NG demand in the industrial sector. Prospects are mixed for various industries. Three of the top four gas-consuming industries are projected to realize strong growth: chemicals, iron and steel, and processed foods are expected to increase output by 30% or more above their pre-recession 2007 levels by 2025. Three other industries—petroleum and coal products, non-metallic minerals, and pulp and paper—are expected to show small gains compared with 2007. Lagging gas demand in the slow-growing industries will partly offset the strong growth in the growing industries.

IHS Energy expects industrial-sector NG demand in the U.S. Lower 48 to rise by 17% from 20.9 Bcfd in 2014 to 24.5 Bcfd in 2025. The West South Central (Texas and Louisiana) and the East North Central and Pacific regions, the home of growing manufacturing activity and petrochemical plants, are expected to account for 44%, 15% and 11% of industrial NG demand by 2025, respectively.

“There is a mismatch, geographically, in the growth in natural gas demand and supply in the U.S. Lower 48. The sum of exports, power, and industrial demand will substantially exceed supply growth in the West South Central, East South Central, and Mountain regions, creating a demand for new natural gas infrastructure to serve these divisions.”

The U.S. Lower 48 will be a net exporter of NG in 2018.²⁷ With U.S. Lower 48 NG supplies more than adequate to meet domestic demand and significantly cheaper than global supplies, an increasing amount will be desired by export markets. Pipeline exports to Mexico from the West South Central (Texas) and Mountain (Arizona) divisions are increasing significantly in the medium term, and LNG exports from the West South Central (Texas and Louisiana) are expected to

²⁷ U.S. Lower 48 net exports include LNG exports and natural gas pipeline exports to Canada and to Mexico. North America (Canada and the U.S. Lower 48) has been a net exporter since 2011.

begin in 2016. By 2025, LNG exports and pipeline exports to Mexico from the U.S. Lower 48 are expected to reach 15 Bcfd, up by 15% since 2014.

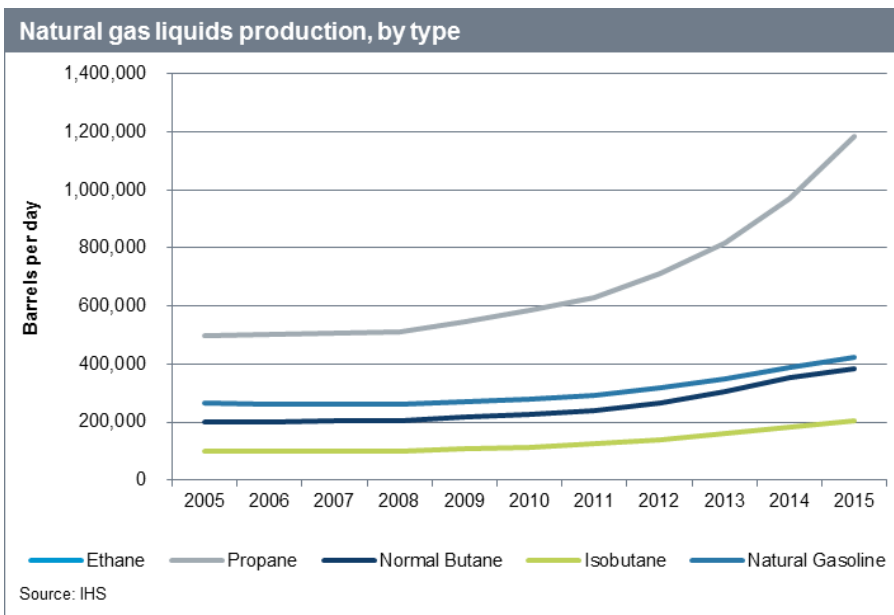
There is a mismatch, geographically, in the growth in NG demand and supply in the U.S. Lower 48. The sum of exports, power, and industrial demand will substantially exceed supply growth in the West South Central, East South Central, and Mountain regions, creating a demand for new NG infrastructure to serve these divisions. In contrast, supply growth will significantly outpace demand growth in the Mid-Atlantic region. In addition to the Marcellus and Utica gas production developments, there will be some other areas of significant pipeline and processing plant infrastructure activity. For instance, LNG exports will, in many cases, require upstream pipeline capacity expansions—of varying degrees—to support steady-state utilization of liquefaction facilities. These will range from 50 to 100 miles for pipeline header systems in the U.S. Gulf Coast to transport NG from existing pipeline systems to the LNG terminal facilities. New pipeline capacity will also be required in New England, parts of the Southeast, and Florida to support power-sector demand for gas.

The need for new capacity would increase existing regional constraints and bottlenecks in the NG transmission network, with the extent of the effect varying by region. As we note above, the primary drivers of growth in demand for NG are increased use of it to generate electricity and higher production in manufacturing. The map above presenting demand growth for NG between 2014 and 2025 by Census region shows that absolute increases in demand will range between 0.7 Bcf/d and 2.6 Bcf/d in seven of the nine regions, with the largest increases of 5.4 Bcf/d and 16.3 Bcf/d occurring in the South Atlantic and West South Central Regions, respectively. As states and electric utilities proceed with planning to comply with the most recent set of CPP regulations, the demand for NG to generate electricity is likely to change. Our December 2015 analysis of the CPP finds that between 2022 and 2040 NG consumption for electric power generation under mass trading will average 4.6 Bcfd higher than under our reference case that assumes no CPP. The same analysis finds that average annual coal consumption for the electric power generation during the same period will be 15% lower than under the reference case.

Natural Gas Liquids and Petrochemicals

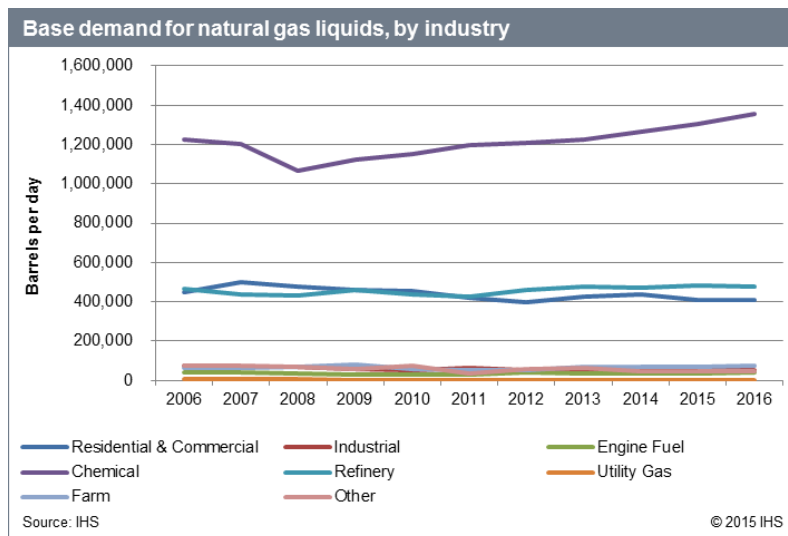
The production of NGLs has grown more than 60% from 2010 through 2015, and is forecast to grow another 42% through 2020. Newer current and forecast productive capacities and volumes of NGLs from the Eagle Ford shale, Utica shale, Marcellus shale, and tight oil plays and sub-plays in the Permian Basin present large potential opportunities for petrochemical feedstock consumption.

NGLs, such as ethane, propane, butane, isobutane, and pentane, are used in a variety of industries including cooking and heating for residential and commercial and petrochemical and plastic. Manufacturers that require large volumes of NGLs as a feedstock must be connected to a pipeline, as other modes of transportation are unable to provide the volumes they require.



Regions and manufacturers have experienced some limitation in their ability to make use of additional NGLs supply as the midstream processing and pipeline capacity has not kept up with resource development.

Integrating the refining capacity into the area to a petrochemical complex could improve the competitive position of an area's refiners relative to international refiners. Similarly, the added flexibility and markets the U.S. Gulf Coast refiners enjoy because of the local petrochemical complexes give them an operational and cost advantage over refiners that do not have petrochemical complex access. As midstream pipeline capacity expands to regions with insufficient or no current access to NGLs, opportunities will expand for NGL processing, and most especially, for industries that require large volumes of forward-linkage products, such as manufacturers that use NGLs as their raw material.



An example of midstream capacity challenges

The increase in NGL supply in the Marcellus region has led Sunoco Logistics to develop the Mariner East system that will deliver NGLs via pipeline to its Marcus Hook Industrial Complex in Delaware County, Pennsylvania; the first phase started operating in December 2014. The availability of NGLs will be a key factor in creating an integrated petrochemical complex in the Philadelphia market. If petrochemical capacity can be built, additional opportunities could be realized through the integration with surrounding refineries and into the local economy. In 2012, there was some concern of potentially 'stranded' NG in Marcellus due to the lack of takeaway capacity which would have created a supply of discounted gas that could have been used in gas-to-liquid (GTL) options. However, the development of GTL options depends upon the relative competitiveness of pricing between oil and NG, and the cost of converting NG into petroleum products. Given current oil market pricing, the pricing differential between the two resources is too small to justify conversion costs. Additionally, the lead time required for the construction of the Mariner East 2 pipeline, which would carry NGLs, specifically propane, from Marcellus to the Philadelphia area, also limits the speed with which manufacturers can take advantage of the large supply availability.

The completed Mariner East 1 pipeline has the capacity to deliver 70,000 barrels per day of ethane and propane to the MHIC. The proposed Mariner East 2 pipeline project consists of two new pipelines, the first phase of which would have a capacity of 275,000 b/d of NGLs such as propane, butane and ethane. When complete, the entire Mariner East pipeline system would have a capacity of between 350,000 and 750,000 bpd. The Marcellus and Utica supply potential for ethane as a petrochemical feedstock for the manufacturing of ethylene could be as much as 1.1 million barrels per day, assuming 80 percent of the ethane produced with NG is extracted. Ethane crackers produce ethylene, a basic chemical commodity that is a major building block used widely in the overall petrochemical value chain. Ethylene is the root chemical for many varieties of plastics, resins, adhesives, synthetic products,²⁸ and also used in solvents, urethanes, and pharmaceuticals. In March 2016, the first vessel carrying an export shipment of ethane was loaded at the Marcus Hook Industrial Complex bound for a petrochemical plant in Norway.

²⁸ <http://www.alleghenyfront.org/story/frequently-asked-questions-about-ethane-crackers>.

CHAPTER THREE: NATURAL GAS PIPELINE CONSTRUCTION & OPERATION COSTS

Backward Linkages

The economic sectors that provide the goods and services used in the construction and operation of NG pipelines are referred to, in this report, as backward linkages. The backward linkages consist of the economic sectors that provide intermediate inputs required to construct the pipelines that deliver NG to end users, such as commercial and industrial businesses, transportation, electric-generating plants that use it as a fuel, and residential customers. Pipeline construction generates increases in economic activity when inputs (e.g., steel pipe, coatings, construction equipment, compressors, motors, gauges and instruments, sand and gravel, engineering and design services, etc.) are purchased from suppliers, defined as the indirect impacts, and through the spending of disposable income by the construction workers. The total economic impacts generated in a regional economy when a NG pipeline is built or expanded will depend on the mix of intermediate inputs required and the extent to which they can be obtained from within the region as opposed to from suppliers in distant locations. The purposes of this section are to describe the types and shares of goods and services used in constructing and operating NG pipelines and to present unit capital cost estimates (i.e., dollars per mile) for typical pipelines to provide an estimate of the level of direct spending that can occur in regional economies when they are installed.

Capital expenditures for constructing, expanding, and repurposing existing NG pipelines have had a significant contribution to the U.S. economy since the expansion of unconventional oil and gas technology. In this section, we will describe the components of pipeline construction and operations and their respective costs. In Chapter Five, we will measure their economic impacts of constructing and operating NG transmission lines in the United States

Capital expenditures for constructing new, and expanding or repurposing existing, NG pipelines, and related infrastructure, such as compressor and pump stations, have had a significant impact on the U.S. economy. The rapid growth in the supply of affordable domestically produced NG resulting from the rise of the unconventional energy sector has greatly increased the demand for new NG pipelines and related infrastructure and, by extension, for the goods and services they require, especially for the capital equipment from the manufacturing sector. In this section, we will describe the cost components of pipeline construction and operation and also present unit capital costs (i.e., dollars per mile) for typical pipelines. Capital and O&M cost estimates are presented for typical diameters of gathering, transmission, and distribution NG pipelines. Both the capital and annual O&M costs apply only to new 2015 pipeline construction.

The construction and operating costs for NG pipelines will vary based on a number of factors that affect the design of the pipeline, including:

- Nominal diameter.
- Length.
- Function (e.g., gathering, transmission or distribution).
- Volumetric flow.
- Pressure.
- Number and spacing of compressor or booster stations.
- Physical and environmental conditions along a right of way that affect costs, such as topography, weather, soil and geologic conditions, types of habitat and adjacent land uses, number of crossings required for rivers, highways, rail, etc.
- Costs for obtaining permits, engineering design fees, insurance, and other services.
- Cost of acquiring rights of way.

The IHS approach for estimating pipeline capital and operating costs included several tasks summarized below. IHS analyzed data from the Pipeline and Hazardous Materials Safety Administration (PHMSA)²⁹ on the existing mileage of gathering and transmission lines by nominal diameter to determine the most frequent diameters. IHS utilized this information along with its industry and project-related experiences to identify and determine the diameter of typical distribution pipelines. IHS then selected two diameters for the three types of pipelines, resulting in six different cost scenarios. Current design and performance standards, such as pressure and capacity for typical pipelines, were applied by IHS. Once the design assumptions were finalized, IHS then used publically available pipeline cost information from historical and proposed NG pipeline projects along with its proprietary estimating tool, IHS QUE\$TOR software, to produce a detailed breakdown of capital and operation costs for typical NG pipelines. Average price levels for United States were assumed. A description of QUE\$TOR is provided at the end of this chapter. As a result, the capital and operating costs presented below for typical NG pipelines are based on actual project information as compiled by IHS.

Length of Onshore Natural Gas Transmission and Gathering Pipelines Lines by Diameter, 2014

Nominal Diameter	Transmission Lines		Gathering Lines	
	Miles	Share	Miles	Share
4" or less	21,715	7.3%	2,114	18.6%
6"	21,963	7.4%	1,292	11.3%
8"	24,968	8.4%	1,382	12.1%
10"	16,443	5.5%	963	8.5%
12"	27,586	9.3%	963	8.5%
14"	2,395	0.8%	131	1.1%
16"	24,175	8.1%	575	5.0%
18"	4,824	1.6%	46	0.4%
20"	25,720	8.6%	306	2.7%
22"	4,589	1.5%	28	0.2%
24"	29,787	10.0%	501	4.4%
26"	13,497	4.5%	23	0.2%
28"	149	0.0%	35	0.3%
30"	42,437	14.3%	27	0.2%
32"	19	0.0%	-	0.0%
34"	1,913	0.6%	54	0.5%
36"	25,639	8.6%	67	0.6%
38"	0	0.0%	5	0.0%
40" and above	9,521	3.2%	2,861	25.1%
Not Classified	460	0.2%	19	0.2%
Total	297,800		11,390	

Note 1: transmission lines include both interstate and intrastate lines

Note 2: gathering lines include both type A and type B

Source: US Department of Transportation, Pipeline And Hazardous Materials and Safety Administration, June 2015

<http://phmsa.dot.gov/portal/site/PHMSA/menuitem.6f23687cf7b00b0f22e4c6962d9c8789/?vgnextoid=a872dfa122a1d110VgnVCM1000009ed07898RCRD&vgnextchannel=3430fb649a2dc110VgnVCM1000009ed07898RCRD&vgnextfmt=print>

Natural Gas Pipeline Projects, Top 10

State	Project capacity (MMscf/d)	New pipe mileage	Proportion of new mileage	Proportion of capacity
PA	21,605	10,268	30%	21%
OH	14,277	9,427	27%	14%
WV	4,315	2,726	8%	4%
IN	1,210	2,050	6%	1%
KY	1,294	1,962	6%	1%
AL	7,947	1,717	5%	8%
WY	3,773	1,114	3%	4%
TX	12,745	1,056	3%	12%
NJ	3,406	697	2%	3%
ND	693	568	2%	1%

Source: IHS Energy, 2015.

Notes: Rankings based on mileage, forecasted in-service dates range from 2010 to 2018.

As described in Chapter Two, the most recent pipeline developments have occurred as a result of new unconventional shale production in the Marcellus and Utica plays. Pennsylvania, Ohio, and West Virginia have had the greatest number of new NG pipeline mileages proposed and in the process of development since 2010. Unconventional oil activity in North Dakota has also triggered the need for pipeline infrastructure in North Dakota and Wyoming. Portions of the South, such as Texas, Kentucky, and Alabama, continue to experience growth in pipeline demand.

Capital and operation costs are fairly standard across regions, but can vary somewhat based on conditions along the right of way. For example, in mountainous regions or those with harsh climates, costs for booster stations are likely to be higher to account for additional pressure requirements. Similarly, building through densely populated regions will result in additional costs for crossings of linear transportation infrastructure, such as highways, railroads, and other pipelines.

²⁹ U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, August 2015, [Distribution, Transmission and Gathering, LNG, and Liquid Annual Data](http://phmsa.dot.gov/portal/site/PHMSA/menuitem.6f23687cf7b00b0f22e4c6962d9c8789/?vgnextoid=a872dfa122a1d110VgnVCM1000009ed07898RCRD&vgnextchannel=3430fb649a2dc110VgnVCM1000009ed07898RCRD&vgnextfmt=print).

<http://phmsa.dot.gov/portal/site/PHMSA/menuitem.6f23687cf7b00b0f22e4c6962d9c8789/?vgnextoid=a872dfa122a1d110VgnVCM1000009ed07898RCRD&vgnextchannel=3430fb649a2dc110VgnVCM1000009ed07898RCRD&vgnextfmt=print>

The costs for capital equipment used in pipelines, such as steel pipe, coatings, equipment, pumps, etc., will be very similar across the United States for most projects at the point of production (i.e., there may be only a small number of manufacturers and locations where the capital equipment is made) but the delivered costs will vary based on the distance to the construction site and the transport mode used to ship the input. Companies that design and build NG and oil pipelines usually have the experience and capability to work under local construction regulations and labor laws and can smoothly work with the applicable government agencies and labor organizations. These companies provide planning, engineering, construction, and project management services, utilizing their fleets of specialty construction equipment on country-wide basis. Thus, some capital goods and construction services are “imported” into a region, especially if the project is located in a remote, rural area, which reduces the overall local economic benefits that new pipeline construction provides.

Wage Levels in Oil and Natural Gas Pipeline Construction Occupations		
State	Average Annual Wage in 2014	Index (US = 1.00)
Arizona	\$ 48,411	0.97
Colorado	\$ 52,552	1.05
Massachusetts	\$ 61,032	1.22
Michigan	\$ 45,340	0.91
Virginia	\$ 47,189	0.95
US	\$ 49,892	1.00

Note: wage levels were calculated as weighted averages using employment in occupational category

Source: Bureau of Labor Statistics, 2015, Occupational Employment Statistics (OES) for the 2014

One of the largest potential variations in construction costs for NG pipelines comes from labor costs, which, as shown in the accompanying table, vary substantially by state. Companies that provide specialized pipeline construction services will hire local workers in the construction trade occupations if they are available and are often required to first hire them from the local union. In North Dakota’s Bakken play, demand for pipeline construction rose rapidly and due to insufficient quantities of locally skilled labor, many skilled workers were brought to the region as temporary labor. In Pennsylvania’s Marcellus play, the local supply of skilled labor was larger, and fewer temporary workers were required, but even there, specialized workers, such as foremen with pipeline construction expertise, were imported from outside the region.

Construction and Operating Costs for Typical Natural Gas Pipelines

As noted above, IHS identified a variety of typical pipeline characteristics using current and historical pipeline construction trends and national statistics on pipeline characteristics from PHMSA. A diameter-inch range of pipeline costs were developed for two diameters for each pipeline type to provide high and low cost estimates, which were expressed on a unit basis or the cost per mile. The construction costs presented below do not include the cost of acquiring rights of way, as it is highly project specific.

Natural Gas Gathering Pipelines

Based on the PHMSA database, there were 11,390 miles of NG gathering pipelines in 2014. Gathering pipelines are located in oil and gas fields and, therefore, are concentrated in the major oil and NG-producing states.

Capital costs for NG gathering lines assumed a pressure of 200 pounds per square inch gauge (psig), capacity of 25 MMCF/D, and a length of 25 miles in level terrain. These assumptions resulted in a total cost per mile ranging from \$1.4 million to \$1.8 million, respectively. Capital costs for gathering pipelines account for 39 percent and 46 percent respectively of total costs for the two sizes of gathering pipes. This averages to approximately \$560,000 and \$828,000, respectively, per mile of gathering pipeline mile. The construction costs for labor (i.e., wages and fringe benefits) comprise 23% and 21% respectively of the total cost for the two diameters of gathering pipes.

Unit O&M costs for the two sizes of newly constructed gathering pipelines are \$154,000/mile and \$163,000/mile annually. The largest shares of costs are for operations labor and logistic and consumables, which accounted for about 80% of operations costs. Gathering pipeline systems have the highest levels of operations labor of the three analyzed pipeline systems. The unit O&M cost declines steadily after the first few years of operation as the new lines are integrated into existing systems.

Natural Gas Transmission Pipelines

Based on the PHMSA database, there were 297,800 miles of on-shore NG gathering pipelines in 2014. NG transmission pipelines convey pipeline-ready NG from production locations to demanding regions. As described in Chapter One, they flow along general transportation corridors and through switching hubs. Costs for transmission lines assumed a pressure of

900 psig, a capacity of 700 MM/d, and a length of 200 miles, resulting in a total unit construction cost per mile of \$1.9 million and \$3.6 million, respectively, for the two diameters.

Capital costs, which include equipment and materials, account for 44.3% and 56.1% of the total cost of constructing the two sizes of pipeline, equivalent to approximately \$860,000 and over \$2 million of capital expenses per transmission pipeline mile. The construction cost figures for labor (i.e., wages and fringe benefits) comprise 27% and 21.9% respectively, of the total cost for the 12-inch and 30-inch lines.

Operations costs for newly constructed transmission pipelines ranged from \$86,000 to \$116,000 per pipeline mile. Given the cumulative distance and activities needed to operate and maintain networks of transmission pipelines, the bulk of costs are composed of operations labor, logistics and consumables, and insurance expenses. Operation labor costs account for a smaller portion of costs than for gathering lines, as do inspection and maintenance costs. Insurance costs and logistics and consumables are significantly higher as compared to gathering lines, the potential risks involved when moving large volumes of NG through long distances.

Natural Gas Distribution Pipelines

In 2014, there was a total of 1,264,387 miles of NG distribution lines in the United States. Natural gas distribution pipelines connect transmission lines to the consumer through an intricate series of small lower-pressure lines. As described in Chapter One, distribution pipelines systems are typically built and operated by local gas distribution utilities.

Costs for distribution pipelines were estimated for 4-inch and 8-inch diameters, assumed a pressure of 100 psig, a capacity of 10 MMcf/d, and a distance of 5 miles. The assumptions are for newer projects, and they resulted in total construction costs per mile of \$1.4 million and \$1.6 for the two sizes. Capital costs for distribution pipelines, which include equipment and materials, account for just under half of the total cost of constructing the pipeline. This averages to approximately \$141,000 to \$262,000 of capital expenses per distribution pipeline mile. Capital costs for distribution pipelines account for 10% and 16.7% of the total cost, much lower than the shares for the transmission and gathering lines, and equivalent to \$141,000 and \$262,000, respectively, per pipeline mile.

Annual O&M unit costs for newly constructed distribution lines were \$90,000 and \$93,000 per pipeline mile for the two sizes. The largest shares of costs were for operations labor and logistic and consumables, which accounted for about 70% of operations costs. The annual O&M costs only apply to new construction; over time, as new distribution lines become fully integrated into the existing pipeline distribution systems, and as network and economies of scale effects are captured, annual unit O&M costs for distribution lines will decline.

IHS QUESTOR Model

Over the years, IHS has developed and continuously refines a software tool called QUESTOR that is used for analyzing the costs of new oil and gas projects. It was used to determine the NG pipeline construction and operating costs contained in the tables above. The program has recently undergone a complete software rewrite, retaining all the former capabilities but adding a significant increase in speed and functionality. QUESTOR™ is a project modeling, evaluation and decision-support system for global application in the oil and gas industry. The program enables users to estimate and run sensitivities on the CAPEX and OPEX of alternative field development plans. Using detailed technical algorithms and regional databases, QUESTOR™ provides a consistent methodology for generating cost estimates and optimizing development plans. At the heart of QUESTOR™ are cost and technical databases (user accessible and customizable) covering all producing regions of the world. These databases are updated every six months with costs gathered from actual projects, fabricators, vendors, and service companies. Using primary input data (recoverable reserves, reservoir depth, and water depth), a production profile is generated, the development concept is defined, and design flowrates calculated. The program then sizes facilities, pipelines, and substructures, and calculates capital costs, drilling costs, operating costs, and abandonment costs. These costs are then scheduled to provide project cash flows. The regional databases are populated with unit rates for equipment items, materials, fabrication installation, hookup and commissioning, and other project costs. QUESTOR™ has been benchmarked against actual project costs and is continuously maintained to reflect the latest changes in technology

CHAPTER FOUR: NATURAL GAS PIPELINE, MANUFACTURERS, AND THEIR FORWARD LINKAGES

Natural Gas–Intensive Sectors

The manufacturing sector uses NG primarily as a fuel and feedstock and to support activities performed during the production of manufactured goods. As described in a recent IHS report³⁰ the manufacturing sector uses NG as a fuel in the following specific ways:

- Direct process uses: drying, melting, process cooling and refrigeration, and driving machines
- Direct non-process uses: heating facilities, ventilation and air conditioning, lighting
- Indirect uses: as a boiler fuel for producing steam and generating electricity

Fuel use accounts for approximately 91% of total NG used by the manufacturing sector with the remaining 9% used as a feedstock, concentrated primarily in three sectors: petroleum and coal products (i.e., refining), chemicals, and primary metals. The first two sectors accounted for 48.4% and 44.2% of total feedstock use of NG by the U.S. manufacturing sector in 2010.³¹

To identify the manufacturing subsectors that are most dependent on, and thus would benefit directly from, increased supplies of NG in a regional economy, we updated our March 2014 study on industrial gas demand by analyzing the use of NG by manufacturing subsectors at the 3-digit NAICS level. The purpose of this analysis was to identify subsectors that were both:

- Intensive users, defined as consuming high amounts of NG in billions of cubic feet per \$1 billion of real, or
- Large aggregate users of NG.

The primary source of NG consumption information by manufacturing subsectors was the U.S. Department of Energy's Manufacturing Energy Consumption Study (MECS).³² The MECS presents the 2010 consumption of nine types of energy by manufacturing subsectors, generally at the 3-digit NAICS level, but with some selected four-digit sectors also included. We combined this information with IHS estimates of real output by manufacturing subsector to derive estimates of NG use intensity. We also estimated the intensity of electric power use by subsector to capture the effect of lower prices of NG as a fuel used to generate electric power either purchased from utilities or generated on site. The manufacturing sector accounted for about 23% of total U.S. consumption of NG in 2010.³³

Manufacturers generate substantial amounts of electric power on site, so they benefit indirectly from lower NG prices. According to the EIA³⁴ in 2014 the industrial sector generated just over 144 million megawatt hours of electric power on site, 60% of which was produced by burning NG.

The following table presents the results of the analysis. A total of nine three-digit sectors are identified as intensive NG–using sectors; they are also, for the most part, the largest absolute consumer of NG. The nine NG–intensive sectors accounted for 91.3% of total NG used by the manufacturing sector in 2010. At the time this report was performed (late 2015), the 2010 MECS was the most recent year for which data was available.

³⁰ IHS CERA, March 2014, [U.S. Industrial Gas Demand – The Striking Turnaround Progresses](#).

³¹ U.S. Department of Energy, Energy Information Administration, 2010, [Manufacturing Energy Consumption Survey](#), Table 1.1 First Use of Energy for All Purposes (Fuel and Nonfuel).

<http://www.eia.gov/consumption/manufacturing/data/2010/>.

³² U.S. Department of Energy, Energy Information Administration, 2010, [Manufacturing Energy Consumption Survey](#), Table 1.1 First Use of Energy for All Purposes (Fuel and Nonfuel).

<http://www.eia.gov/consumption/manufacturing/data/2010/>.

³³ U.S. Department of Energy, Energy Information Administration, 2010, [Annual Energy Review 2010](#).

<http://www.eia.gov/totalenergy/data/annual/archive/038410.pdf>.

³⁴ U.S. Department of Energy, Energy Information Administration, October 2015, [Electric Power Monthly](#).

http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_01.

Natural Gas and Electricity Use by Manufacturing Sub-sectors in 2010

Manufacturing Sub-sector	Natural gas consumption (billions of cubic feet)	NG Intensity: billions of cubic feet/\$1 billion in constant 2010 output	Intensity rank	Net electricity use (million kWh)	Electricity use intensity: million kWh/\$1 billion in constant 2010 output	Intensity rank
311 Food	567	0.94	7	75,407	124.74	9
312 Beverage and Tobacco Products	37	0.21	16	8,449	48.06	19
313 Textile Mills	31	1.08	6	13,240	459.99	1
314 Textile Product Mills	9	0.42	11	2,458	114.15	11
315 Apparel	2	0.16	18	1,069	83.44	15
316 Leather and Allied Products	1	0.11	19	243	26.14	21
321 Wood Products	34	0.47	10	15,323	210.26	6
322 Paper	390	2.40	3	60,497	372.13	3
323 Printing and Related Support	33	0.37	12	13,704	154.02	8
324 Petroleum and Coal Products	892	1.93	5	47,014	101.70	12
325 Chemicals	2,192	3.41	1	131,932	205.52	7
325 Plastics and Rubber Products	101	0.52	9	45,797	234.20	5
327 Nonmetallic Mineral Products	266	2.65	2	32,576	324.68	4
331 Primary Metals	550	1.99	4	117,284	423.51	2
332 Fabricated Metal Products	159	0.52	8	37,206	121.61	10
333 Machinery	70	0.21	15	20,386	61.34	17
334 Computer and Electronic Products	41	0.09	21	29,503	66.00	16
335 Electrical Equip., Appliances, and Components	35	0.32	13	10,689	99.17	13
336 Transportation Equipment	125	0.16	17	38,832	50.52	18
337 Furniture and Related Products	13	0.23	14	4,960	88.89	14
339 Miscellaneous	16	0.10	20	7,598	47.01	20
Durables	1,309	0.49		314,357	117.26	
Non-durables	4,255	1.77		399,810	166.31	
Total	5,564	1.09		714,167	140.45	

Sectors in grey and bold are natural gas intensive sectors

Sources: IHS CERA, March 2014, US Industrial Gas Demand – the Striking Turnaround Progresses IHS, 2015. US Industry Service, Output by Manufacturing Sector. United States Department of Energy, Energy Information Administration, 2010, Manufacturing Energy Consumption Survey, Table 1.1 First Use of Energy for All Purposes (Fuel and Nonfuel) <http://www.eia.gov/consumption/manufacturing/data/2010/>.

The table shows that the nine NG-intensive sectors are generally the largest, and most intensive, users of electricity; they used 74.3% of all electricity consumed by the U.S. manufacturing sector in 2010. Because the NG-intensive sectors both consume a lot of electricity and use it intensively, it means that lower NG prices will have two beneficial effects on them: 1) a direct reduction in the costs of purchasing and using NG, especially in the three sectors that use it as a feedstock and 2) an indirect reduction in costs through the use of cheaper electricity.

In addition to the long-term effect of the CPP in increasing the use of NG as a fuel to generate electricity, the EPA's November 2015 final revisions to "National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers, and Process Heaters," known as Boiler MACT (for maximum achievable control technology) also provides an incentive for manufacturing establishments to use increasing amounts of NG as a fuel for boilers and process heaters. Boilers produce steam that is used in production processes; to directly generate electricity on site; in cogeneration applications, such as combined heat and power (CHP) facilities that produce both steam and electricity; and to heat commercial and institutional buildings. Process heaters heat intermediate inputs used during manufacturing production.

Electric Use by the Manufacturing Sector

The immediately preceding table presents the total amount of electric power used by the 3-digit manufacturing subsectors in 2010, along with the intensity of use in millions of k per \$1 billion in real 2010 output. For the most part, the largest and most intensive uses of NG are also the largest and most intensive users of electric power, with the exception being the petroleum and coal sector, whose use intensity for electric power is below average. The consumption of electric power is more evenly distributed across the manufacturing sector than NG, with durable and non-durable manufacturing accounting for 44% and 56% respectively of total electricity use. The intensity of electricity use in the non-durables is 41.8% higher than in the durable sectors.

States with Clusters of Natural Gas-Intensive Sectors

Based on the nine NG intensive sectors identified above, IHS used our proprietary Business Markets Insights (BMI) database to identify states that have above-average concentrations of economic activity (e.g., employment and output) in these sectors. The BMI database allows us to analyze, at the 6-digit NAICS level detail, the economies of all U.S. states, metropolitan statistical areas, and counties.

The next table below presents estimates of economic activity—employment and output—in the NG-intensive sectors by state in 2015, excluding the District of Columbia. IHS uses output when measuring the level of economic activity within the NG intensive sectors, in addition to showing the total value of production, as it is also a good indicator of both demand for inputs through the backward linkages and demand for output through the forward linkages. Because productivity (i.e., output per worker) varies so widely across the manufacturing sector, including within the nine NG-intensive sectors, employment figures can be somewhat misleading, as sectors like petroleum and coke products have very high output per worker.

The five states with highest absolute levels of output in the NG-intensive sectors are Texas, California, Illinois, Ohio, and Pennsylvania. Another group of five states—Texas, California, Louisiana, Illinois, and Pennsylvania—all have very large petroleum refining sectors; these five plus New Jersey and Ohio also have high levels of activity in chemical manufacturing.

The five states with the highest output location quotients (LQs) in the NG-intensive sectors are Louisiana, Indiana, Arkansas, Iowa, and Wisconsin. These five states have smaller economies that specialize in individual sectors such as food (e.g., Arkansas, Iowa, and Wisconsin), petroleum refining, and chemicals (e.g., Louisiana), paper (e.g., Arkansas, Louisiana, and Wisconsin), and primary and fabricated metals (e.g., Indiana). The five states with the highest output LQs also tend to have the highest employment LQs, along with Alabama, Ohio, and Nebraska. Louisiana's employment LQ in the NG-intensive sector is relatively low, as much of its output occurs in petroleum refining, a capital-intensive sector with a very high output/employment ratio.

Twenty-nine states had output LQs greater than 1.0 for the NG-intensive sector and accounted for 68.5% of total U.S. output in these sectors in 2015. Similarly, 27 states had employment LQs greater than 1.0 higher for the entire NG-intensive sector and accounted for 61.7% of total U.S. employment that same year.

According to the EIA,³⁵ the top NG-producing states in 2014, in descending order, were Texas, Pennsylvania, Alaska, Oklahoma, Wyoming, Louisiana, Colorado, New Mexico, Arkansas, and West Virginia, all with annual gross withdrawals of at least 1,000,000 MMcf. Together these 10 states accounted for 87.4 of total U.S. NG production that year. Three states—Alaska, Colorado, and New Mexico—had output LQs for the entire NG sector of less than 1.0, suggesting that a high proportion of the NG they produce is exported to other states instead of being used within them as an intermediate input by other manufacturing subsectors.

³⁵ EIA, 2015, Natural Gas Gross Withdrawals. http://www.eia.gov/dnav/ng/ng_prod_sum_a_EPG0_FGW_mmc_f_m.htm

Employment and Output in Natural Gas Intensive Sectors by State in 2015						
State	# of Jobs	% of Mfg. Sector	Employ. LQ	Output (millions of \$)	% of Mfg. Sector	Output LQ
Alabama	130,814	50.4%	1.69	\$62,260.2	51.7%	1.56
Alaska	13,156	87.3%	0.99	\$5,400.7	92.7%	0.67
Arizona	51,911	33.0%	0.51	\$25,749.3	34.9%	0.46
Arkansas	95,475	61.0%	1.96	\$38,659.7	70.8%	1.72
California	468,015	37.3%	0.75	\$381,001.8	53.6%	0.90
Colorado	60,127	42.8%	0.61	\$34,902.2	51.0%	0.59
Connecticut	62,806	38.3%	0.96	\$36,375.1	45.1%	0.79
Delaware	17,035	67.0%	0.98	\$10,989.1	79.9%	1.08
Florida	131,591	39.7%	0.42	\$56,682.8	46.6%	0.35
Georgia	185,773	50.7%	1.13	\$78,825.6	56.2%	0.84
Hawaii	8,359	60.6%	0.34	\$4,125.3	79.6%	0.36
Idaho	34,319	56.7%	1.27	\$16,218.1	64.7%	1.27
Illinois	278,815	48.7%	1.21	\$179,827.0	57.8%	1.20
Indiana	212,295	40.8%	1.78	\$117,229.9	47.1%	1.82
Iowa	107,212	49.6%	1.66	\$53,057.7	57.7%	1.68
Kansas	68,535	42.5%	1.21	\$39,572.3	51.1%	1.34
Kentucky	98,764	42.4%	1.30	\$50,371.0	39.9%	1.32
Louisiana	98,489	66.7%	1.25	\$145,509.2	88.7%	2.92
Maine	26,662	52.4%	1.10	\$10,931.1	61.3%	1.00
Maryland	45,729	44.2%	0.45	\$28,932.6	55.4%	0.46
Massachusetts	99,478	40.0%	0.75	\$61,624.5	49.0%	0.67
Michigan	201,883	35.1%	1.23	\$107,521.4	30.0%	1.08
Minnesota	140,879	44.2%	1.25	\$71,943.7	56.4%	1.12
Mississippi	60,389	42.4%	1.33	\$27,983.9	50.7%	1.38
Missouri	120,445	46.7%	1.07	\$55,108.6	50.6%	0.97
Montana	11,611	59.8%	0.61	\$8,230.6	80.3%	0.96
Nebraska	57,050	58.3%	1.40	\$23,426.8	66.7%	1.19
Nevada	18,205	43.0%	0.38	\$7,486.8	51.1%	0.32
New Hampshire	26,143	39.2%	1.03	\$10,635.4	42.7%	0.73
New Jersey	133,119	54.6%	0.86	\$110,852.3	71.6%	1.04
New Mexico	12,819	47.8%	0.39	\$9,317.2	66.4%	0.60
New York	194,483	43.7%	0.55	\$96,016.3	54.9%	0.38
North Carolina	215,603	48.0%	1.30	\$94,538.4	51.1%	1.09
North Dakota	11,622	46.2%	0.59	\$6,240.1	58.2%	0.55
Ohio	312,061	45.7%	1.49	\$159,625.4	50.1%	1.39
Oklahoma	65,993	46.0%	0.97	\$37,026.8	58.2%	1.06
Oregon	87,829	48.2%	1.25	\$38,397.0	52.4%	1.02
Pennsylvania	301,965	53.7%	1.33	\$156,177.6	63.3%	1.22
Rhode Island	17,671	43.1%	0.95	\$7,177.1	51.2%	0.74
South Carolina	114,981	49.2%	1.50	\$52,735.2	51.3%	1.40
South Dakota	19,864	45.9%	1.11	\$6,192.7	48.5%	0.80
Tennessee	145,166	44.3%	1.29	\$75,693.4	47.2%	1.26
Texas	433,371	48.2%	0.93	\$419,273.5	68.1%	1.34
Utah	53,411	43.0%	1.00	\$29,230.5	58.7%	1.05
Vermont	14,316	44.5%	1.16	\$5,845.7	53.8%	1.03
Virginia	100,670	43.1%	0.67	\$45,200.5	48.5%	0.53
Washington	104,546	36.3%	0.85	\$71,308.5	46.6%	0.87
Washington DC	331	40.5%	0.01	\$355.0	55.7%	0.02
West Virginia	32,309	65.1%	1.05	\$17,738.9	75.7%	1.32
Wisconsin	235,690	50.2%	2.04	\$95,947.7	56.5%	1.68
Wyoming	6,634	67.7%	0.55	\$9,917.4	89.9%	1.41

Source: IHS, 2015, Business Markets Insights database.

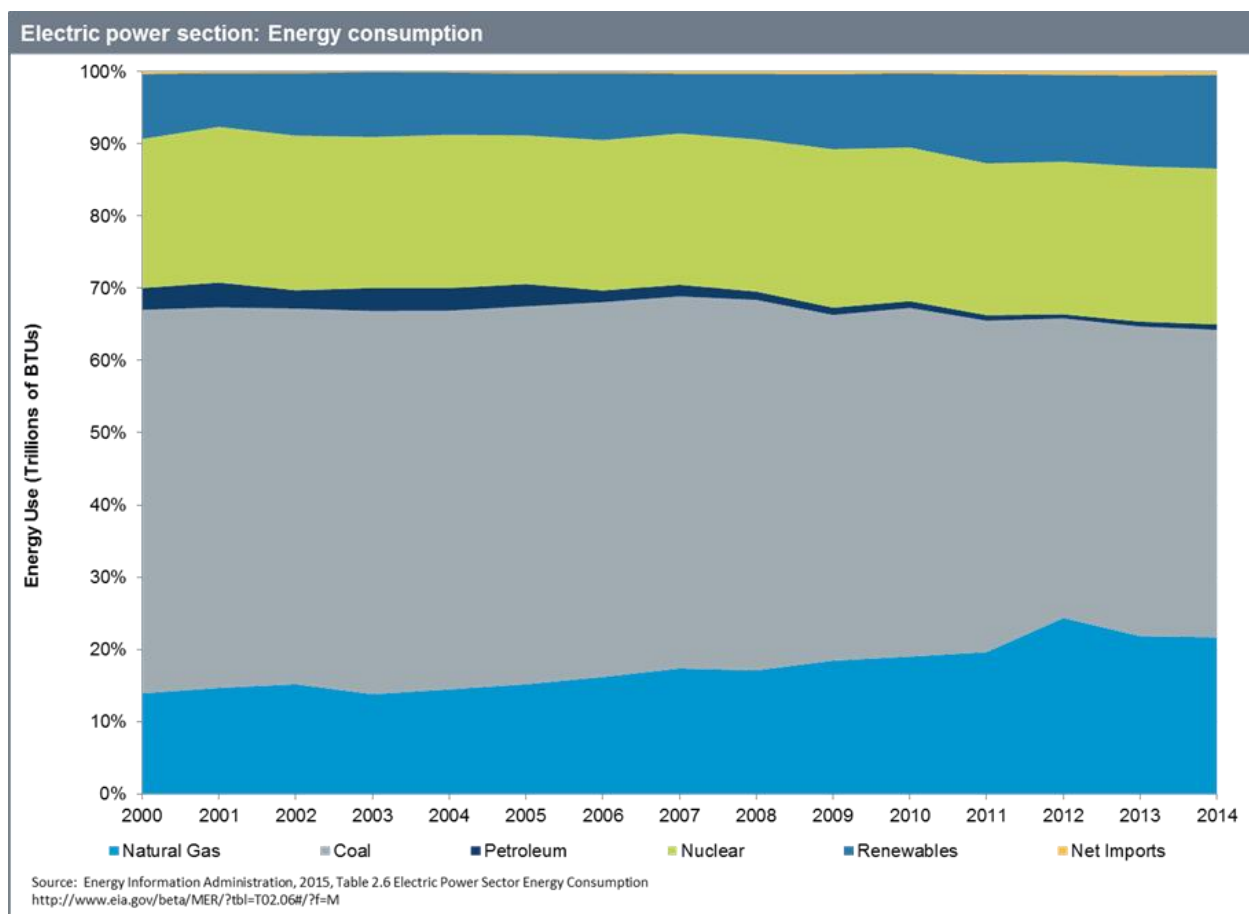
Note: location quotient values of 1.0 or higher are shaded grey

By contrast, there are a number of large states with high levels of output and employment in the-intensive sectors that produce little or no NG, showing they are dependent on the NG pipeline system to receive their inputs. The large, pipeline-dependent states include California, Illinois, Indiana, Michigan, New Jersey, Ohio, New York, and Wisconsin.

Finally, the NG-intensive sectors account for high shares of manufacturing economic activity in a number of smaller states including Alaska, Arkansas, Delaware, Louisiana, West Virginia, and Wyoming. These states have less diversity, with NG-intensive activity concentrated in few sectors, resulting in high LQs. By contrast, the NG-intensive sectors account for below-average shares of manufacturing activity in some large states with diverse manufacturing sectors including Arizona, California, Florida, Michigan, Virginia, and Washington. These larger states have higher concentrations of manufacturing activity in high-tech subsectors such as transportation equipment, computers and electronics, machinery, and electrical equipment.

Use of Natural Gas for Electric Energy Generation

The amount of NG being used as a fuel to generate electricity has been gradually increasing in recent years due in part to the decreasing price and increased supply of NG. Electric utilities have been increasingly turning to NG as a fuel source, especially for new electric-generating plants, such as combustion turbines and combined-cycle plants. The primary benefit to the manufacturing sector is that the increasing use of low-cost NG as a fuel will result in lower generation cost for electric power. Between 2007 and 2014, the amount of NG used in the generation of electricity rose at a CAGR of 2.6%, increasing by 19.4%. Over that same period, the total amount of energy used by electric power from all sources (e.g., fossil fuels, nuclear, renewables, and imports) fell by 4.4% at a CAGR of -0.6%. The significance of shifting electric power sources to this study is that the rising demand for the use of NG as a fuel in electric power generation will contribute to investment in new NG infrastructure, such as transmission lines, gas processing plants, and compressor stations.



Forward Linkages

The outputs from the NG-intensive sectors are used as inputs by other sectors of the economy in a variety of ways. These uses will be referred to as forward linkages and include:

- Intermediate inputs (e.g., goods and services sold to other sectors that are used in production processes to make other types of good and services, with no sales to final demand occurs).
- Sales to final demand (e.g., goods and services that are not used as intermediate inputs and no further processing of the output occur).

Types of final demand include:

- Personal consumption expenditures (e.g., purchases of refined products such as gasoline at filling stations or home heating oil).
- Gross private investment.
- Private inventory accumulation.
- Exports or imports.
- Government consumption and gross investment.

The forward linkage, or downstream manufacturing sectors, will potentially benefit from increases in the supply and/or reductions in the price of NG that occur when the construction of new, or the expansion of existing, NG pipelines occurs. The existing establishments in the nine NG-intensive sectors in a regional economy could potentially decide to expand, which would, in turn, increase the supplies of, or reduce the prices of, their outputs that are used as intermediate inputs by downstream sectors. IHS identified forward linkages in the manufacturing sector by analyzing the detailed input/output tables for the U.S. economy, and by using the results of other recent energy studies we have performed.

Final demand sectors, such as personal consumption, exports, and imports, are also affected by changes in NG production and pricing, but indirectly, through industry production changes captured by intermediate inputs shifts to industry production. For example, personal consumption impacts, such as those resulting from lower electricity prices, are captured first by the feedstock inputs to the electricity industry and flow-through to all industries before resulting in lower prices for the consumer. U.S. industries' substitution of domestic NG over higher-cost NG imports or higher-priced NG-derived goods from abroad (such as manufactured chemicals) flow-through intermediate inputs, either adjusting production processes toward less-expensive items or as increases in value-add or outputs. We, therefore, focus on the intermediate inputs in this section, but describe indirect final demand results in our macroeconomic analysis later on.

The accompanying table shows the percentage distribution of output sold as an intermediate input by a NG-intensive sector (i.e., the columns). The purchasing manufacturing subsectors are shown at the 3-digit NAICS code level. For example, 25.1% of the total output sold as an intermediate input by the primary metals sector was purchased by fabricate metals, while 11.7% went to machinery. The intermediate inputs used by industries varies widely across the nine NG-intensive sectors, ranging from lows of 13.7% in the petroleum and coal sector (i.e., a high share of refined products are sold to non-manufacturing sectors such as utilities, transportation, and construction) up to 70.3% in chemicals and 94.6% for primary metals (most primary metal is then fabricated to make other products). Natural gas-intensive sectors with high shares of their output sold as an intermediate input to other manufacturing sectors are those that are potentially more likely to generate increased downstream economic development within a regional economy if their production increases, and prices fall, due to the completion of a new NG pipeline.

Use of output from the natural gas intensive sectors as an intermediate input by other sectors

NAICs Code	Description	311- Food	313- Textile Mills	321-Wood Products	322- Paper	324- Petroleum and Coal	325- Chemicals	327- Non Metallic Minerals	331- Primary Metals	332- Fabricated Metals
Manufacturing Sectors										
311	Food	44.0%	0.2%	0.1%	11.3%	0.6%	0.8%	0.8%	0.0%	2.3%
312	Beverage and Tobacco Product	4.0%	0.1%	0.2%	2.3%	0.1%	0.2%	2.8%	1.4%	1.6%
313	Textile Mills	0.0%	10.9%	0.0%	0.2%	0.0%	1.6%	0.1%	0.0%	0.1%
314	Textile Product Mills	0.0%	14.6%	0.1%	0.1%	0.0%	1.0%	0.0%	0.1%	0.1%
315	Apparel	0.0%	7.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
316	Leather and Allied Product	0.3%	0.6%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
321	Wood Product	0.0%	1.6%	20.0%	0.4%	0.2%	0.5%	1.0%	0.1%	1.0%
322	Paper	0.2%	5.1%	3.6%	26.2%	0.5%	1.9%	0.2%	0.1%	1.2%
323	Printing and Related Support Activities	0.3%	1.1%	0.0%	7.6%	0.5%	1.1%	0.0%	0.0%	0.5%
324	Petroleum and Coal Products	0.1%	0.1%	0.0%	0.2%	4.4%	1.8%	0.8%	0.1%	0.2%
325	Chemical	1.4%	0.0%	0.3%	3.9%	4.7%	40.9%	1.1%	0.1%	2.7%
326	Plastics and Rubber Products	0.0%	5.2%	1.3%	3.1%	0.3%	11.4%	1.2%	0.6%	2.0%
327	Nonmetallic Mineral Product	0.0%	0.8%	0.4%	1.2%	0.3%	0.9%	12.7%	0.4%	1.0%
331	Primary Metal	0.0%	0.0%	0.3%	1.0%	0.4%	0.4%	1.9%	24.7%	1.6%
332	Fabricated Metal Product	0.0%	0.0%	0.2%	1.5%	0.2%	1.5%	1.0%	25.1%	11.8%
333	Machinery	0.0%	2.0%	0.8%	1.5%	0.4%	0.9%	1.6%	11.5%	8.9%
334	Computer and Electronic Product	0.0%	0.1%	0.7%	1.2%	0.1%	1.3%	0.8%	3.4%	4.1%
335	Electrical Equip. & Appliances	0.0%	0.0%	0.3%	0.9%	0.3%	0.7%	1.2%	6.5%	2.9%
336	Transportation Equipment	0.0%	7.9%	2.9%	2.1%	0.2%	1.7%	4.5%	16.3%	13.6%
337	Furniture and Related Product	0.0%	7.8%	7.4%	0.9%	0.1%	0.4%	0.3%	1.3%	1.1%
339	Miscellaneous	0.0%	5.2%	1.0%	1.4%	0.1%	1.2%	0.5%	2.6%	1.4%
Total share to manufacturing		50.4%	70.8%	39.7%	67.3%	13.7%	70.1%	32.5%	94.4%	58.2%
Non-Manufacturing Sectors										
	Construction, NR, & Mining	8.7%	4.4%	41.7%	2.2%	17.8%	7.2%	52.8%	2.2%	24.8%
	Trade, Transportation & Utilities	0.3%	9.0%	4.3%	5.2%	33.5%	1.1%	1.0%	0.6%	3.3%
	Information	0.0%	0.4%	1.9%	2.8%	0.2%	0.3%	1.3%	0.2%	2.8%
	Financial Activities	0.0%	0.4%	3.7%	1.3%	1.3%	1.0%	0.3%	0.9%	0.6%
	Professional and Business Services	0.2%	1.0%	1.1%	4.2%	2.1%	3.4%	3.5%	1.0%	3.0%
	Education and Health Care Services	7.2%	3.7%	0.9%	4.5%	1.5%	10.0%	2.5%	0.2%	0.6%
	Leisure & Hospitality Services	22.6%	3.4%	3.2%	3.8%	1.5%	0.4%	3.3%	0.2%	2.4%
	Other Services	0.2%	1.7%	0.2%	0.5%	0.6%	0.8%	0.8%	0.1%	1.0%
	Government	10.3%	5.2%	3.4%	8.1%	27.7%	5.8%	2.1%	0.3%	3.2%
Total share to non-Mfg. uses		49.6%	29.2%	60.3%	32.7%	86.3%	29.9%	67.5%	5.6%	41.8%

Note: The figures show the percent of the total output, commodity basis, produced by the natural gas intensive sectors (top of each column) that are purchased by the row industry as an intermediate input. For example, 11.4% of the output of chemicals sector (column 8) is sold to the plastics and rubber sector as an intermediate input (row 15).

Source: Bureau of Economic Analysis, 2015, 2007 Benchmark Input-Output coefficients After Redefinitions

Macroeconomic Impacts of Lower Natural Gas Prices

IHS estimated the macroeconomic impacts of lower NG prices on the U.S. economy, with a specific focus on the effects on the manufacturing sector. The wholesale and retail prices of NG in the United States have remained low, and even declined, in recent years due to the rapid increase in production from shale formations, such as the Marcellus play in western Pennsylvania and the Eagle Ford play in Texas.

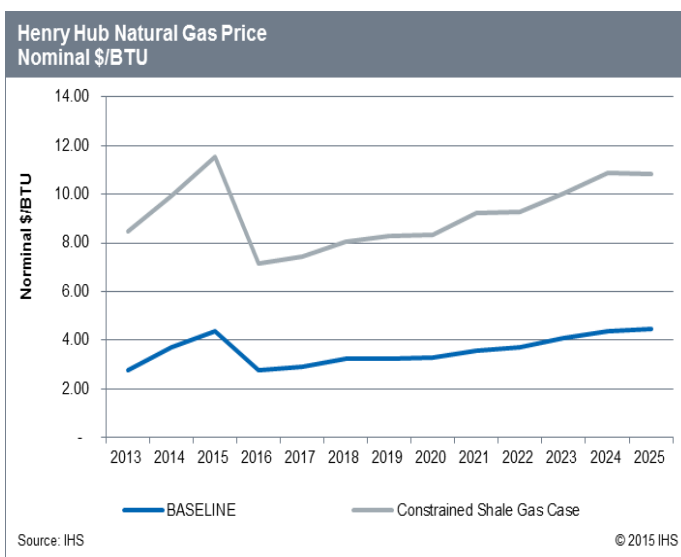
In addition to the direct, indirect, and induced economic contributions of investing in and operation of new NG pipelines built to carry the increased supplies to the market, the surge in domestic production, due in large part to the increased supplies from shale gas production, has led to NG and, subsequently, electricity prices that are significantly lower than they otherwise would have been. The result has been low and stable NG prices that have had a positive macroeconomic impact across all sectors of the economy, as costs of intermediate inputs have been lowered. We find this effect has been especially positive in the NG-intensive sectors identified above and in other manufacturing subsectors that use large amounts of electricity.

In this section, IHS estimates the economic effects of lower prices for NG using the IHS U.S. Macroeconomic Model.

The supply of NG at the wellhead in the United States has grown substantially in recent years, from 48.2 Bcfd in 2005 to an estimated 74.3 Bcfd in 2015, an average annual growth rate of 4.4%. The significant increase in production volumes has contributed to a sharp drop in prices, with the average annual Henry Hub price, in nominal dollars, falling from \$8.80/MMBtu in 2005 to an estimated \$2.60/MMBtu in 2015, a decline of 238.2%. According to IHS's December 2015 Monthly Gas Briefing Outlook, NG prices are expected to decline slightly in 2016 to \$2.51/MMBtu before rising steadily thereafter, reaching \$3.36/MMBtu by 2020.

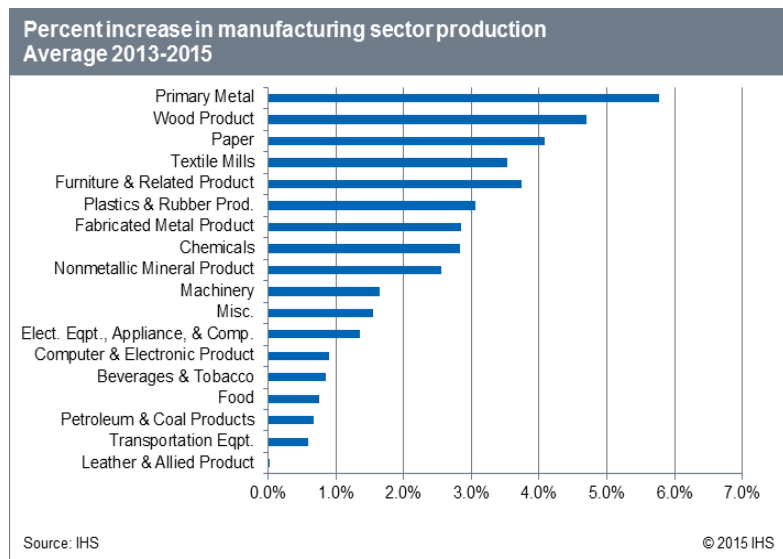
To capture the macroeconomic contributions of NG pricing decreases, we compared the price of NG to the prices of alternative competing energy sources and feedstock. We performed an update to a previous counterfactual analysis performed by IHS in 2011 for America's Natural Gas Alliance (ANGA). Consistent with the previous study, we also considered the long-term expectation of future lower NG prices, where manufacturers and other industries will transition production processes to incorporate additional use of NG as a fuel and/or feedstock. Until recently, repeated and persistent historical price volatility of domestic NG resources had resulted in import dependency from Middle Eastern and Asian resources, particularly for the chemical manufacturing industry. We incorporated the declining reliance of the U.S. economy on NG imports that will result from the decrease of pricing and increased availability of domestic NG sources.

The IHS macroeconomic forecast is updated monthly and has already incorporated the short- and longer-term effects of NG price and availability on the U.S. and global economy. As a result of this methodological restraint, and to be consistent with the 2011 IHS study, we performed a counterfactual analysis that we refer to as the Constrained Shale Gas Case. We started the scenario runs in 2012, reducing U.S. NG production growth rates to historical trends and increased NG prices to global LNG prices, specifically following European oil-linked prices. Reduced domestic NG availability would be met, in the short term, with a return to historical trends of higher-level imports of NG resources to meet the growing domestic demand for NG as a feedstock and fuel source (and the indirect use of NG for electricity production). The counterfactual impacts were evaluated for short-term and long-term price effects alone, without consideration of capital investment shifts.



Results

The short-term impacts of today's NG prices, as opposed to constrained shale gas case with European oil-linked prices, are increases to GDP, employment, and disposable income (across all consumers). GDP increased to a peak of 1.3 percent in 2014 and maintained a 1.2 percent increase into 2015. The employment contribution was 1.2 million in 2014 and 1.4 million in 2015. The long-term impacts through 2025 represent a shift toward equilibrium, with the scenario differences decreasing with time, in terms of pricing and GDP. The short-term boost in domestic manufacturing competitiveness results in a 2 percent increase in U.S. manufacturing capacity utilization, which is sustained at 1 percent higher than the constrained shale case from 2020 through 2025. The U.S. economy also enjoys reductions in inflation and unemployment. Overall, North American NG prices



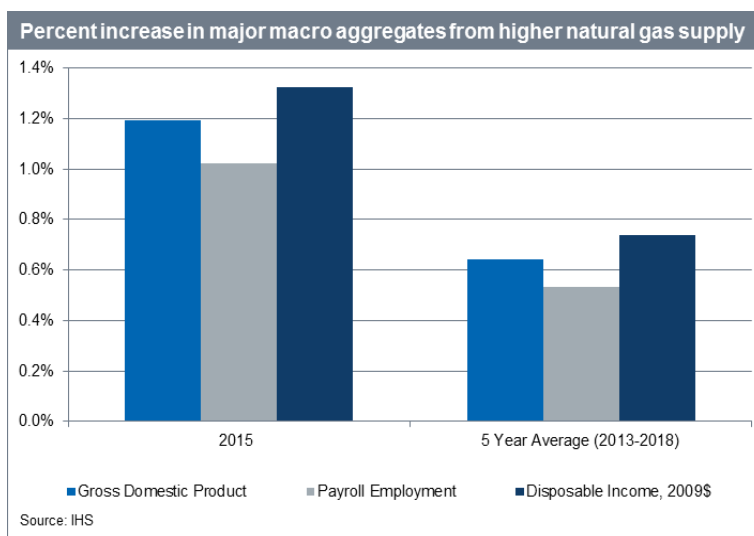
have increased in stability, which contributes to long-term investment planning.

Declining NG prices directly reduce electricity prices, as 30 percent of total NG consumption goes to electricity. The model impacts found that retail electricity prices dropped 11 percent in 2013, and the declines in retail electricity prices are expected to persist through 2025.

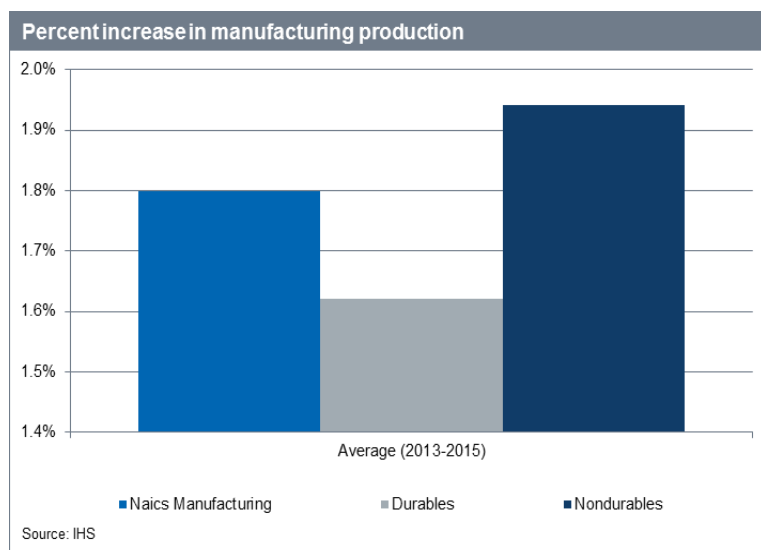
“Lower gas and electricity prices serve to directly reduce the energy costs of households and businesses. Going forward, consumers have greater purchasing power and higher confidence, businesses experience higher profits, and domestic manufacturers are more cost-competitive relative to their international competitors as a result of lower NG prices.”³⁶

Reduction in NG and electricity prices result in an increase in real personal consumption expenditures in the short-term period of 2013 to 2016, peaking in 2014, with an increase in personal consumption expenditures of consumer durables of 3.1 percent. Investment also increases in the short term, with investment growing an average of 2.7 percent between 2013 and 2015, but increases return to equilibrium after 2015. Both exports and imports, overall, receive a modest increase with the reduction of NG pricing, with increases ending by 2016. Imports grow at an average rate of 1.4 percent between 2013 and 2016, faster than exports, which grow at a rate of 0.3 percent in the same time period. The increase in imports is mostly associated with an increase in consumption spending.

The benefits of higher NG supply to the economy, which lowers and stabilizes energy prices and electricity prices in particular, can be summarized by the three main macroeconomic aggregates that impact households: real GDP, employment, and real disposable income. The gains in 2015 alone are significant. IHS estimates that, as a result of the increase in domestic shale gas production, real GDP (goods and services) is \$190 billion greater and there are 1.4 million more jobs, contributing up to \$156 billion more dollars of real disposable income in 2015. Over the five-year period of 2013 to 2018, IHS forecasts, on average, \$101 billion more dollars in real GDP each year. This is produced with an average 730,000 more jobs in the economy each year contributing to \$87 billion more dollars in real disposable income per year.



Impact on Key Manufacturing Sectors

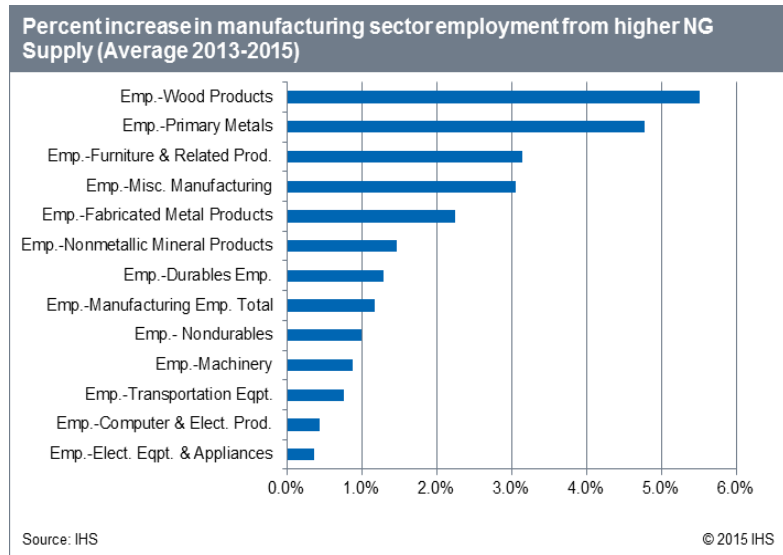


In addition to the demand generated by energy-intensive sectors and the indirect and induced impacts on manufacturing, lower gas prices, from higher gas supply, that help to lower energy costs also increases employment and productivity, which results in a corresponding increase in personal income. From 2013 to 2015, personal income averaged 1.4% higher and households also spent less on electricity, which had the combined effect of greater spending on consumable goods and services. The overall impact on manufacturers across a broad swath of industries is positive.

As expected, the increase in production due to lower NG prices is significantly greater in the non-durable sectors than in the durable sectors. The benefits from the reduction in electricity prices are more evenly

³⁶ “The Economic and Employment Contribution of Shale Gas in the United States,” IHS 2011. Prepared for America’s Natural Gas Alliance.

distributed across the manufacturing sector. In 2010, the durable and non-durable sectors accounted for 44% and 56% respectively of the total electricity used by the manufacturing sector. The intensity of electricity use in non-durable sector was 41.8% greater than in the durable sector.



The reason for the difference in the use-intensity of electricity is that several of durable sectors use relatively little electricity in their production processes while generating high levels of output. The impact in the short term is greater than over the longer term due to the natural adjustments that occur in a dynamic economy. As industries adjust to the new reality (in the counterfactual case, higher gas prices), all other prices begin to adjust so that the relative price differentials reach equilibrium. As this occurs, the initial production gains begin to level out and return to their normal path of growth.

A closer look at the distribution of the percent increases in production by subsector shows that the NG intensive—sectors rank high on the list shown in the accompanying chart. Five of the NG intensive

sectors—primary metals, paper, fabricated metals, chemicals, and non-metallic minerals—rank in the top 10. By contrast, the percent production increases in the food and petroleum and coal products sectors are much lower. Similar patterns can be seen in the employment contribution.

CHAPTER FIVE: ECONOMIC EFFECTS OF NATURAL GAS PIPELINE CONSTRUCTION AND OPERATION

The purpose of this section is to assess the economic impact of the construction and operation and maintenance (O&M) of NG pipelines on the U.S. economy, with a detailed analysis of the impacts on the manufacturing sector. The focus of this section is on NG transmission lines. We first summarize unit costs for the construction and operation of NG transmission lines.

Natural Gas Pipeline Costs

As described in earlier sections of this report, there are three types of NG pipelines: gathering, transmission, and distribution. We performed a two-part analysis: first, we estimated the economic impact from the construction and operation of transmission pipelines forecast to be commissioned and begin operations in 2015, and second, we derived the economic contribution of transmission pipelines operating prior to 2015. To estimate the economic impact from the construction and operation of the proposed 2015 transmission pipelines, we determined their unit construction costs, in dollars per mile, for two typical diameters. Based on our proprietary data, IHS estimated unit capital and O&M costs for the two sizes of transmission pipelines as presented below; the O&M costs apply to only newly constructed pipelines during their first few years of operation.

- **12" diameter:** Capital costs of \$1,942,000/mile with corresponding annual O&M costs of \$86,000/mile.
- **20" diameter line:** Capital costs of \$3,591,000/mile with corresponding annual O&M costs of \$116,000/mile.

To estimate the economic impacts of operating and maintaining the existing NG transmission pipeline system, additional research was required. The NG transmission system in 2014 consisted of about 297,800 miles of on-shore pipeline, including active, inactive, and abandoned pipelines. IHS combined our proprietary data with an analysis by IHS Energy of the FERC³⁷ Form 2 and 2a company-level data to estimate an average annual O&M expenditure of about \$32,900 per existing transmission pipeline mile.

Because costs vary widely by project, and due to the difficulty of tracking and obtaining accurate data for many local projects, we did not estimate the economic impacts of constructing and operating NG gathering or distribution lines in the United States. While IHS continually collects data on proposed NG transmission lines, we do not track proposed gathering or distribution line projects. We note that the primary impacts on the manufacturing sector occur during the construction phase, especially for transmission lines with their larger sizes and higher unit costs, because of the need for manufacturing products such as steel, pumps and compressors, and equipment.

U.S. Economic Impacts of Natural Gas Transmission Line Construction

IHS estimates that approximately \$25.8 billion was spent in the United States in 2015 to construct the proposed 6,028 miles of new NG transmission pipelines. IHS continually monitors the status of major NG transmission pipeline projects across the country because of their importance to the NG pipeline system, so this expenditure figure is based on actual data. Approximately 92% of the spending was for transmission pipelines with a diameter of at least 30 inches. The accompanying table shows that the construction spending generated a temporary increase in employment of 348,789 jobs, including 59,874 in the manufacturing sector. Similarly, the proposed spending is expected to contribute \$34 billion to total U.S. GDP, with 23.2% of that increase flowing to the manufacturing sector. The contribution to labor income was \$21.9 billion in 2015, with 21.5% occurring in the manufacturing sector. The share of the total U.S. economic impacts occurring in the manufacturing sector is lowest for employment because of the sector's high level of worker productivity (i.e., high values of output and GDP per worker) and its above-average wage levels.

³⁷ Federal Energy Regulatory Commission, 2015, Form 2/2A Major and Non-Major Natural Gas Pipeline Annual Report <http://www.ferc.gov/docs-fling/forms/form-2/data.asp>

The accompanying table shows that for every mile of NG transmission line pipeline built, a total of 57.9 jobs would be created in the United States, including 9.9 manufacturing jobs per mile. The total U.S. economic impacts presented in the table are the sum of the direct spending, and the indirect and induced multiplier effects.

A major objective of this study is to measure how the construction of new NG transmission pipelines affects the manufacturing sector. The share of economic benefits flowing to the manufacturing sector for the 30-inch diameter pipeline is higher than the share for the 12-inch diameter pipeline because expensive capital goods and equipment, such as steel pipe and pumps, comprise a higher share of the unit cost for the 30-inch diameter line.

IHS estimated the total U.S. economic impacts within manufacturing. Appendix A presents the U.S. impacts for each of the 86 4-digit NAICS codes within the manufacturing sectors. While the appendix shows that all of the manufacturing subsectors will benefit to some extent, between 71% and 75% of the economic impacts, depending on the unit of measurement considered (e.g. jobs, labor income, output, and value-added), will occur in the following 14 subsectors:

- 3241 Petroleum & Coal
- 3251 Basic Chemicals
- 3255 Paint, Coating, & Adhesives
- 3261 Plastics
- 3273 Cement & Concrete
- 3311 Iron & Steel Mills
- 3312 Steel Product Mfg. From Purchases
- 3315 Foundries
- 3323 Architectural & Structural Metals
- 3327 Machine Shops
- 3329 Other Fabricated Metal Products
- 3331 Agriculture, Construction, & Mining Machinery
- 3339 Other Machinery
- 3344 Semiconductor & Computers

Manufacturing Employment Impacts by State

The increase in manufacturing employment (59,874 direct jobs) from building NG transmission lines in 2015 was disaggregated by 3-digit NAICS manufacturing subsector within each state. The first step in this analysis was to determine where direct pipeline spending would occur in 2015 by state. IHS distributed the \$25.8 billion of direct spending as follows:

- 30% for specialized capital goods and equipment such as steel pipe, compressors, and off-highway machinery was allocated to those states where potential suppliers are located. IHS industry experts identified the states most likely to receive the direct spending. For example, IHS steel industry experts identified producers in 16 states with mills capable of producing the type of steel pipe required for NG transmission lines.

US Economic Impacts of Construction Spending for New Natural Gas Transmission Lines in 2015

Impact Measure	Total Change in Economic Activity	% in the Mfg. Sector	Impact per Mile
Employment (# of jobs)	348,789	17.2%	57.9
Direct	112,760	27.5%	18.7
Indirect	104,336	20.8%	17.3
Induced	131,693	5.8%	21.8
Labor Income (Millions of US\$)	\$ 21,855.3	21.5%	\$ 3.63
Direct	\$ 7,845.1	32.2%	\$ 1.30
Indirect	\$ 7,253.5	23.6%	\$ 1.20
Induced	\$ 6,756.7	6.8%	\$ 1.12
Output (Millions of US\$)	\$ 32,267.9	37.5%	\$ 5.35
Direct	\$ 11,602.4	44.5%	\$ 1.92
Indirect	\$ 10,990.3	46.1%	\$ 1.82
Induced	\$ 9,675.1	18.3%	\$ 1.61
Contribution to GDP (Millions of US\$)	\$ 33,979.7	23.2%	\$ 5.64
Direct	\$ 10,164.8	37.6%	\$ 1.69
Indirect	\$ 11,736.1	26.2%	\$ 1.95
Induced	\$ 12,078.9	8.2%	\$ 2.00

Note: The figures above include only the construction of 2015 proposed transmission lines. Additional economic impacts from the construction of gathering and distribution lines are. IHS does not track gathering or distribution line projects.

- 70% for items such as construction materials and labor compensation was allocated primarily within states and local economies where pipeline would be built. The distribution was based on shares of project pipeline mileage in each state.

Based on the location of companies capable of providing necessary components such as pipeline steel, we identified 21 states where direct spending on specialized capital goods would occur. The direct spending total in each state was then allocated by economic sector and entered into the appropriate Impact Analysis for Planning (IMPLAN) sector based on the unit pipeline construction cost figures developed for this study.

Appendix B presents the distribution of the U.S. increase in manufacturing jobs by state by 3-digit NAICS manufacturing subsector. As expected, the employment effects largely track with the distribution of direct spending by state, although every state benefits to some extent through the indirect and induced multiplier effects of capital and operating expenditures. The following 10 states combined, listed in descending order of their employment increases, will receive about 74% of the total increase in manufacturing employment: Texas, California, Louisiana, Ohio, Wyoming, Oklahoma, Colorado, Indiana, Illinois, and Pennsylvania. Employment increases are also concentrated in the durable manufacturing sectors because of the composition of the direct spending; nationally, 86% of the employment increase is in the durable goods sectors (e.g., wood, non-metallic minerals, primary and fabricated metals, machinery, electrical equipment, computers, transportation equipment, furniture, and miscellaneous).

U.S. Economic Impacts of Natural Gas Transmission Pipeline Operation and Maintenance

US Economic Impacts of Projected O&M Spending for Natural Gas Transmission Lines in 2016

Impact Measure	Total Change in Economic Activity	Impact per \$1 billion of O&M spending
Employment (# of jobs)	119,754	11,423.6
Direct	22,914	2,185.8
Indirect	27,369	2,610.8
Induced	69,472	6,627.1
Labor Income (Million US\$)	\$ 11,814.8	\$ 1,127.0
Direct	\$ 6,362.2	\$ 606.9
Indirect	\$ 1,830.5	\$ 174.6
Induced	\$ 3,622.1	\$ 345.5
Output (Million of US\$)	\$ 27,143.1	\$ 2,589.2
Direct	\$ 10,305.8	\$ 983.1
Indirect	\$ 5,768.7	\$ 550.3
Induced	\$ 11,068.6	\$ 1,055.9
Contribution to GDP (Million US\$)	\$ 16,510.4	\$ 1,575.0
Direct	\$ 6,950.9	\$ 663.1
Indirect	\$ 3,091.0	\$ 294.9
Induced	\$ 6,468.5	\$ 617.0

Note: The above impacts are the combined O&M expenditures for the 303,828 miles of NG transmission lines operating in 2016, which includes the 6,028 miles of new pipeline constructed in 2015 whose first full year of operation is 2016, and 297,800 miles of existing pipeline. While the spending occurs in 2016, impacts are presented in current 2015\$

\$16.5 billion in GDP in 2016. On a unit basis, for every \$1 billion in direct O&M spending on natural gas transmission lines, the total increase in US employment would be 11,424 jobs, and \$1,575 billion in US GDP. Approximately 4.3% of the total employment increase would occur in the manufacturing sector while 13.7% of the additional GDP would be in manufacturing.

IHS estimated the economic contribution of existing NG transmission lines O&M using an average per mile expenditure of \$32,900 for the 297,800 miles of transmission pipeline. IHS estimates that the total U.S. O&M spending for existing NG transmission pipelines was \$9.8 billion in 2015. This spending resulted in nearly 111,800 jobs in 2015. Detailed manufacturing contributions are located in Appendix C. Natural gas transmission line O&M spending contributed about \$15.4 billion to the U.S. economy in 2015.

The estimates for the annual unit cost of operating and maintaining newly constructed NG transmission lines were \$86,000 and \$116,000/mile for the 12- and 30-inch-diameter pipes, respectively. These cost assumptions were applied to the 6,028 miles of new NG transmission lines that IHS Energy estimates were constructed in 2015, whose first full year of operation is in 2016.

The accompanying table presents the combined impacts on the US economy of O&M spending for both the 297,800 miles of existing natural gas transmission line, and the 6,028 miles of new pipeline built in 2015. These impacts would be generated in 2016 (i.e., during the first full year of operation for new pipelines completed in 2015), but the impacts are presented in 2015 dollars to be consistent with the rest of the report. The combined total of almost \$10.5 billion in O&M spending will contribute 119,753 jobs and

Annual O&M spending generates permanent increases in state and local economic activity, such as employment and value added, as the NG pipeline system has to be continually operated and maintained. At the state and local levels, the economic multiplier effects of O&M spending are usually comparable to or slightly higher than during construction, as higher shares of inputs, including labor, maintenance and repair services, and supplies, are purchased locally. Finally, although the per-mile economic impacts of O&M spending shown in the accompanying table are much lower than for construction, the spending is distributed across roughly 50 times more pipeline miles. Consequently, annual O&M spending generates more permanent benefits overall.

Projections for Continued Growth in Pipeline Spending

United States on-shore NG production rose 30.6% between 2007 and 2013 according to EIA.³⁸ EIA estimates total annual U.S. NG withdrawals in 2014 of 31.346 trillion cubic feet (Tcf). In 2013, on-shore NG production was 93.7% of total U.S. production; if this share holds in 2014, total on-shore gross withdrawals would be 29.4 Tcf. On-shore production, as a share of total U.S. NG production, has been steadily rising in recent years; as recently as 2007, it was 85.9%. Similarly, the EIA estimates U.S. crude oil production has risen from 5.1 million barrels per day in 2007 to 8.7 million barrels per day in 2014, approaching the peak level of domestic oil production of just under 9.0 million barrels per day in 1985.

U.S. pipeline capital spending grew significantly over this same six-year period to support U.S. upstream oil and NG activity and production plans. U.S. oil and NG transmission pipeline project spending increased from approximately \$10.1 billion in 2010 to almost \$37.4 billion in 2015. Average annual U.S. onshore pipeline capital spending over this period was approximately \$20.5 billion, with \$14 billion spent on expanding NG transmission lines and the balance spent on crude oil pipelines. Pipeline project spending was underpinned by the upstream production plans established in prior periods. While the rate of capacity additions could slow over the short term, additions are needed over the medium to long term to meet IHS's view of supply and demand fundamentals.

³⁸ EIA, November 2015, Natural Gas Gross Withdrawals. http://www.eia.gov/dnav/ng/ng_prod_sum_a_EPG0_FGW_mmcf_a.htm.

Appendix A: U.S. Economic Contributions of Constructing Natural Gas Transmission Lines in 2015 by Manufacturing Subsector

Economic Contributions by 4-digit NAICs Mfg. Sector from Constructing Natural Gas Transmission Lines in the US in 2015				
NAICS Code and Description	Employment (Number of jobs)	Labor Income (Millions of US\$)	Output (Millions of US\$)	Contribution to GDP (Millions of US\$)
3111 Animal Food Manufacturing	61	4.7	86.7	13.4
3112 Grain & Oilseed Manufacturing	62	5.7	126.7	15.8
3113 Sugar & Products Manufacturing	75	5.0	42.1	8.9
3114 Fruit & Vegetable Preserving	192	11.5	87.0	18.2
3115 Dairy Product Manufacturing	150	10.9	158.2	20.8
3116 Animal Slaughtering & Processing	509	23.3	203.9	27.5
3117 Seafood Product Preparation	45	2.5	17.4	2.8
3118 Bakeries & Tortilla Manufacturing	323	16.0	80.4	22.9
3119 Other Food Manufacturing	190	14.2	151.7	46.6
3121 Beverage Manufacturing	221	19.5	181.1	50.4
3122 Tobacco Manufacturing	15	2.2	46.6	31.3
3131 Fiber, Yarn, & Thread Mills	26	1.1	9.2	1.6
3132 Fabric Mills	47	2.6	15.7	3.8
3133 Textile & Fabric Mills	42	2.3	12.0	2.9
3141 Textile Furnishings Mills	64	3.1	17.0	4.3
3149 Other Textile Product Mills	98	4.3	15.7	5.2
3151 Apparel Knitting Mills	19	0.6	2.3	0.8
3152 Cut & Sew Apparel Manufacturing	186	7.7	24.8	9.2
3159 Accessories & Other Apparel Mfg.	12	0.5	1.9	0.6
3161 Leather & Hide Finishing	2	0.1	1.2	0.2
3162 Footwear Manufacturing	14	0.6	2.3	0.8
3169 Other Leather Products	12	0.5	2.1	0.7
3211 Sawmills & Wood Preservation	346	18.1	93.9	21.4
3212 Plywood & Engineered Wood Mfg.	245	13.0	58.2	20.0
3219 Other Wood Manufacturing	672	32.1	117.0	38.1
3221 Pulp, Paper & Paperboard Mills	159	17.9	139.2	38.6
3222 Converted Paper Products	481	38.8	218.9	57.0
3231 Support Activities - Printing	727	39.8	123.4	44.9
3241 Petroleum & Coal Prod. Mfg.	392	93.8	2,105.3	634.4
3251 Basic Chemical Mfg.	350	49.9	1,000.9	137.8
3252 Resin, Rubber, & Fiber Mfg.	173	22.8	266.9	37.9
3253 Agricultural Chemical Mfg.	57	6.8	96.1	14.9
3254 Pharmaceutical & Medicine Mfg.	251	44.3	350.3	116.3
3255 Paint, Coating, & Adhesive Mfg.	1,615	172.8	1,264.0	263.2
3256 Soap, Cleaning, & Toiletry Mfg.	108	10.9	129.9	41.5
3259 Other Chemical Product Mfg.	137	14.0	89.1	20.2
3261 Plastic Product Mfg.	1,280	84.1	447.9	144.1
3262 Rubber Product Mfg.	320	22.8	121.1	40.4
3271 Clay Product & Refractory Mfg.	141	9.2	28.7	11.6
3272 Glass & Glass Product	104	7.3	31.2	10.9
3273 Cement & Concrete Products	1,289	83.7	352.6	114.4
3274 Lime & Gypsum Products	69	5.5	33.9	9.9
3279 Other Nonmetallic Mineral Products	337	22.5	120.7	42.4

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Economic Contributions by 4-digit NAICs Mfg. Sector from Constructing Natural Gas Transmission Lines in the US in 2015

NAICS Code and Description	Employment (Number of jobs)	Labor Income (Millions of US\$)	Output (Millions of US\$)	Contribution to GDP (Millions of US\$)
3311 Iron & Steel Mills	1,085	115.8	1,370.7	187.4
3312 Steel Product Mfg. From Purchases	662	54.8	518.9	71.1
3313 Alumina & Aluminum Production	168	14.0	130.3	17.7
3314 Other Nonferrous Metal Production	264	22.1	339.4	36.1
3315 Foundries	1,093	78.4	313.4	92.1
3321 Forging & Stamping	599	47.8	263.6	68.4
3322 Cutlery & Handtool Mfg.	100	7.7	27.5	11.7
3323 Architectural & Structural Mfg.	2,115	139.3	564.8	185.7
3324 Boiler, Tank & Container Mfg.	402	31.1	182.8	49.9
3325 Hardware Manufacturing	36	2.7	12.0	4.4
3326 Spring & Wire Product Mfg.	221	14.0	57.6	21.6
3327 Machine Shops Mfg.	2,004	134.0	374.9	166.8
3328 Coating, Engraving, & Heat Metals	780	47.1	192.5	69.7
3329 Other Fabricated Metal Products	28,771	2,138.2	8,087.7	2,952.9
3331 Ag., Construction, & Mining Machinery	1,869	192.9	1,957.6	530.4
3332 Industrial Machinery Mfg.	60	5.1	24.8	8.7
3333 Commercial & Service Industrial Machinery	130	10.6	60.9	21.6
3334 HVAC & Commercial Refrig. Equipment	236	16.0	69.0	25.0
3335 Metalworking Machinery	225	16.5	45.5	21.7
3336 Turbine & Power Transmission Equip.	239	23.0	193.6	49.5
3339 Other Machinery Mfg.	3,533	322.9	1,644.0	570.8
3341 Computer & Peripheral Eq. Mfg.	77	14.0	89.9	27.4
3342 Communications Eq. Mfg.	116	13.2	56.9	20.0
3343 Audio & Video Eq. Mfg.	14	1.5	8.0	2.0
3344 Semiconductor & Comp. Mfg.	570	62.8	446.1	200.3
3345 Electronic Instrument Mfg.	122	12.0	47.4	18.4
3346 Magnetic Media Mfg.	20	2.6	10.6	3.8
3351 Electric Lighting Eq. Mfg.	156	13.4	57.2	18.8
3352 Household Appliance Mfg.	61	4.9	33.2	8.5
3353 Electrical Equipment	398	36.7	166.6	55.3
3359 Other Electrical Eq. & Comp. Mfg.	258	22.5	114.5	35.8
3361 Motor Vehicle Mfg.	88	9.6	167.5	14.5
3362 Motor Vehicle Body & Trailer Mfg.	100	6.2	31.7	6.2
3363 Motor Vehicle Parts Mfg.	552	41.5	291.7	42.7
3364 Aerospace Product & Parts Mfg.	33	3.8	15.3	4.2
3365 Railroad Rolling Mfg.	32	2.9	18.4	3.4
3366 Ship & Boat Building	30	1.9	8.3	2.1
3369 Other Transportation Eq. Mfg.	25	2.0	18.5	3.1
3371 Household & Institutional Furniture Mfg.	289	13.9	50.4	20.0
3372 Office Furniture & Fixtures Mfg.	33	1.8	8.6	3.3
3379 Other Furniture Related Mfg.	39	2.1	11.4	4.0
3391 Medical Eq. & Supplies Mfg.	232	19.5	61.2	38.6
3399 Other Misc. Mfg.	417	29.5	96.3	48.8
Total in Manufacturing	59,874	4,701.3	26,716.1	7,893.0

Note: The figures above are based on an IHS estimate of \$25.8 billion in spending to construct 6,028 miles of new, on-shore natural gas transmission lines in the US during 2015. Right-of-way acquisition costs are not included.

Appendix B: Employment Contribution of Constructing Natural Gas Transmission Lines in 2015 by State and Manufacturing Subsector

Employment Increases From Constructing of Natural Gas Transmission Lines in 2015 by State and Mfg. sub-sector											
State	311 Food	312 Beverage & Tobacco	313 Textile Mills	314 Textile Product Mills	315 Apparel	316 Leather	321 Wood Products	322 Paper	323 Printing	324 Petroleum & Coal	325 Chemicals
AK	16	1	0	0	0	0	1	0	1	20	0
AL	0	0	0	0	0	0	1	0	0	0	4
AR	82	2	0	2	8	3	26	31	10	9	21
AZ	21	7	1	3	3	0	13	7	13	3	26
CA	49	15	3	5	45	2	10	25	30	8	32
CO	6	2	0	0	1	0	1	4	4	0	1
CT	12	3	1	2	2	0	2	10	13	2	43
DE	19	1	0	0	0	0	1	1	1	6	11
FL	0	0	0	0	0	0	1	0	0	0	4
GA	124	12	27	58	14	0	45	56	33	8	82
HI	12	2	-	0	4	0	1	0	2	5	1
IA	97	3	0	2	5	0	23	14	17	4	44
ID	32	2	0	1	1	0	17	5	3	0	10
IL	31	4	1	4	1	1	20	23	38	13	52
IN	55	14	1	8	5	2	166	27	48	25	364
KS	60	1	0	2	3	0	4	4	19	17	36
KY	51	13	2	2	10	1	25	28	24	9	50
LA	9	3	0	0	1	0	2	6	4	7	4
MA	51	8	5	4	13	2	6	25	28	6	73
MD	1	1	0	0	0	0	2	0	1	1	11
ME	10	4	2	1	2	3	12	16	3	1	9
MI	12	3	1	3	1	0	47	11	18	2	49
MN	91	6	1	4	6	2	30	29	57	21	40
MO	72	13	0	5	16	2	19	23	29	9	79
MS	39	1	1	3	9	0	22	11	4	23	36
MT	5	2	0	1	0	0	8	0	2	8	3
NC	4	0	28	3	2	0	15	5	5	0	12
ND	9	0	0	1	0	0	5	0	2	4	1
NE	66	1	0	1	1	0	4	5	8	0	21
NH	4	2	3	1	1	0	4	6	5	1	10
NJ	0	0	0	0	0	0	0	0	0	0	2
NM	10	2	0	0	1	0	4	2	3	5	9
NV	9	2	0	1	0	0	2	3	7	2	7
NY	11	2	2	3	4	1	16	8	18	1	27
OH	160	39	3	9	9	1	296	71	100	65	1,016
OK	7	3	0	0	1	0	1	2	4	2	1
OR	51	11	0	2	6	1	62	13	15	4	17
PA	38	8	4	6	5	1	179	19	32	21	155
RI	6	1	3	1	0	0	2	4	4	0	13
SC	36	2	20	8	10	0	22	39	12	1	83
SD	16	1	1	1	1	0	5	2	3	0	5
TN	3	1	0	0	1	0	8	1	2	2	18
TX	82	18	2	5	8	2	20	46	47	34	70
UT	31	2	0	2	4	0	6	11	12	11	36
VA	3	1	0	0	0	0	11	1	2	1	19
VT	10	1	0	0	2	0	5	3	3	2	6
WA	74	17	1	4	6	1	37	26	14	23	31
WI	18	1	2	1	0	0	45	18	24	0	12
WV	1	0	0	0	0	0	8	0	1	0	32
WY	0	1	0	0	0	0	0	0	2	1	0
Sector Total	1,608	235	115	162	217	28	1,263	640	727	392	2,691

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Employment Increases From Constructing of Natural Gas Transmission Lines in 2015 by State and Mfg. sub-sector

State	326 Plastics & Rubber	327 Non Metallic Minerals	331 Primary Metals	332 Fabricated Metals	333 Machinery	334 Computer & Electronics	335 Electrical Equip. & Appliances	336 Trans. Equip.	337 Furniture	339 Misc.	State Total
AK	2	0	0	4	0	0	0	0	0	0	46
AL	0	3	0	2	0	0	0	0	0	0	13
AR	23	22	119	153	16	3	16	13	6	8	572
AZ	35	13	56	187	10	52	7	27	10	19	512
CA	56	13	297	4,679	1,041	120	55	18	12	38	6,552
CO	8	2	47	1,339	468	3	2	0	1	5	1,895
CT	18	13	62	292	19	19	26	38	4	17	598
DE	4	4	12	18	1	2	2	1	1	3	88
FL	0	4	0	2	0	0	0	0	0	0	14
GA	94	42	82	272	28	16	37	46	22	24	1,122
HI	6	1	0	4	0	0	0	1	1	2	42
IA	33	23	123	201	55	19	17	16	16	6	720
ID	6	3	10	61	4	20	3	2	3	3	186
IL	72	55	89	338	653	43	83	23	11	30	1,584
IN	108	288	140	354	83	17	43	59	28	33	1,866
KS	33	20	41	159	25	9	9	35	7	6	493
KY	46	33	197	204	26	8	31	57	10	8	835
LA	2	4	55	4,299	1	0	0	1	0	2	4,402
MA	38	26	45	327	23	86	25	12	7	38	848
MD	1	7	0	2	0	0	0	0	0	0	31
ME	7	5	5	56	3	3	0	8	2	3	157
MI	77	44	53	297	82	21	20	78	12	16	847
MN	60	31	129	425	44	69	28	11	17	44	1,143
MO	49	32	124	284	35	15	30	40	12	21	909
MS	28	12	54	94	16	5	17	25	32	6	439
MT	7	1	11	20	2	0	0	1	1	4	77
NC	22	7	12	77	24	12	34	10	5	6	284
ND	8	3	3	28	8	2	1	2	2	2	81
NE	18	11	25	88	13	7	4	8	3	10	294
NH	10	10	36	112	10	22	11	2	2	10	261
NJ	0	1	0	1	0	0	0	0	0	0	7
NM	9	2	6	21	2	10	2	1	1	4	93
NV	26	7	25	55	2	4	2	1	2	14	174
NY	25	25	21	130	48	35	31	11	5	15	439
OH	222	828	125	723	140	33	84	75	32	66	4,096
OK	16	3	76	2,469	396	1	2	5	0	3	2,992
OR	34	13	140	156	17	58	8	11	8	15	642
PA	66	159	115	362	59	26	68	16	16	21	1,378
RI	3	5	31	57	3	5	3	5	2	11	159
SC	48	43	140	265	27	10	35	35	4	12	852
SD	12	3	15	43	9	3	3	4	5	7	138
TN	2	19	0	8	1	0	1	1	1	1	71
TX	117	32	494	12,526	2,572	86	57	41	17	50	16,329
UT	28	10	68	125	10	19	5	11	13	34	438
VA	2	21	0	10	1	0	1	0	1	1	77
VT	9	3	4	24	3	8	3	2	3	3	93
WA	68	18	103	199	22	31	13	95	12	19	813
WI	40	6	72	214	286	15	52	13	10	9	840
WV	1	12	1	4	0	0	0	0	0	1	63
WY	0	0	8	3,256	0	0	1	0	0	1	3,271
Sector Total	1,600	1,941	3,271	35,028	6,291	920	873	861	360	649	59,874

Appendix C: U.S. Economic Contribution of Operating & Maintaining Existing Natural Gas Transmission Pipelines in 2015 by Manufacturing Subsector

US Economic Impacts of Existing Natural Gas Pipeline Operation & Maintenance Spending in 2015 by 4-digit Mfg. sector

NAICS Code and Description	Employment	Labor Income (Millions of US\$)	Output (Millions of US\$)	Contribution to GDP (Millions of US\$)
3111 Animal Food Manufacturing	29	2.3	40.7	6.6
3112 Grain & Oilseed Manufacturing	27	2.5	51.5	7.1
3113 Sugar & Products Manufacturing	36	2.4	20.3	4.4
3114 Fruit & Vegetable Preserving	92	5.6	42.0	8.9
3115 Dairy Product Manufacturing	71	5.3	75.3	10.1
3116 Animal Slaughtering & Processing	243	11.3	96.4	13.4
3117 Seafood Product Preparation	21	1.2	8.2	1.3
3118 Bakeries & Tortilla Manufacturing	155	7.8	38.9	11.2
3119 Other Food Manufacturing	90	6.9	70.1	22.5
3121 Beverage Manufacturing	106	9.6	87.7	24.7
3122 Tobacco Manufacturing	7	1.0	22.7	15.0
3131 Fiber, Yarn, & Thread Mills	9	0.4	3.2	0.6
3132 Fabric Mills	17	0.9	5.4	1.3
3133 Textile & Fabric Mills	15	0.8	4.2	1.1
3141 Textile Furnishings Mills	26	1.3	6.6	1.8
3149 Other Textile Product Mills	48	2.2	7.5	2.6
3151 Apparel Knitting Mills	9	0.3	1.1	0.4
3152 Cut & Sew Apparel Manufacturing	79	3.4	11.2	4.1
3159 Accessories & Other Apparel Mfg.	6	0.2	0.9	0.3
3161 Leather & Hide Finishing	1	0.0	0.4	0.1
3162 Footwear Manufacturing	7	0.3	1.1	0.4
3169 Other Leather Products	5	0.2	1.0	0.3
3211 Sawmills & Wood Preservation	65	3.4	18.5	4.1
3212 Plywood & Engineered Wood Mfg.	37	2.0	9.5	3.1
3219 Other Wood Manufacturing	103	4.9	18.0	5.8
3221 Pulp, Paper & Paperboard Mills	47	5.4	41.5	11.7
3222 Converted Paper Products	132	10.9	62.6	17.1
3231 Support Activities - Printing	276	15.4	46.9	17.4
3241 Petroleum & Coal Prod. Mfg.	141	42.5	1,211.2	305.2
3251 Basic Chemical Mfg.	40	6.0	134.1	18.0
3252 Resin, Rubber, & Fiber Mfg.	26	3.4	38.1	5.5
3253 Agricultural Chemical Mfg.	12	1.5	20.5	3.9
3254 Pharmaceutical & Medicine Mfg.	124	22.2	180.8	58.4
3255 Paint, Coating, & Adhesive Mfg.	27	3.0	21.9	4.5
3256 Soap, Cleaning, & Toiletry Mfg.	50	5.1	59.4	19.1
3259 Other Chemical Product Mfg.	30	3.1	18.5	4.5
3261 Plastic Product Mfg.	272	17.9	92.3	30.6
3262 Rubber Product Mfg.	36	2.7	14.3	4.8
3271 Clay Product & Refractory Mfg.	13	0.8	2.7	1.1
3272 Glass & Glass Product	30	2.2	9.3	3.4
3273 Cement & Concrete Products	79	5.3	22.2	7.2
3274 Lime & Gypsum Products	9	0.7	4.6	1.3
3279 Other Nonmetallic Mineral Products	24	1.6	7.7	2.8

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US Economic Impacts of Existing Natural Gas Pipeline Operation & Maintenance Spending in 2015 by 4-digit Mfg. sector

NAICS Code and Description	Employment	Labor Income (Millions of US\$)	Output (Millions of US\$)	Contribution to GDP (Millions of US\$)
3311 Iron & Steel Mills	36	3.9	45.8	6.3
3312 Steel Product Mfg. From Purchases	23	2.0	18.8	2.5
3313 Alumina & Aluminum Production	21	1.8	16.4	2.3
3314 Other Nonferrous Metal Production	16	1.4	19.9	2.3
3315 Foundries	34	2.4	9.4	2.8
3321 Forging & Stamping	27	2.0	11.0	3.0
3322 Cutlery & Handtool Mfg.	29	2.2	7.9	3.4
3323 Architectural & Structural Mfg.	352	23.9	97.7	32.2
3324 Boiler, Tank & Container Mfg.	29	2.3	14.3	3.8
3325 Hardware Manufacturing	7	0.6	2.5	0.9
3326 Spring & Wire Product Mfg.	22	1.4	5.7	2.2
3327 Machine Shops Mfg.	171	11.6	31.5	14.3
3328 Coating, Engraving, & Heat Metals	103	6.3	25.3	9.3
3329 Other Fabricated Metal Products	103	8.0	40.4	15.2
3331 Ag., Construction, & Mining Machinery	12	1.1	8.3	2.4
3332 Industrial Machinery Mfg.	8	0.7	3.4	1.2
3333 Commercial & Service Industrial Machinery	3	0.3	1.4	0.5
3334 HVAC & Commercial Refrig. Equipment	218	15.4	58.9	21.9
3335 Metalworking Machinery	19	1.4	4.0	1.9
3336 Turbine & Power Transmission Equip.	10	1.0	7.1	2.1
3339 Other Machinery Mfg.	22	1.9	9.0	3.2
3341 Computer & Peripheral Eq. Mfg.	29	5.5	24.5	10.9
3342 Communications Eq. Mfg.	20	2.4	9.8	3.8
3343 Audio & Video Eq. Mfg.	6	0.6	2.9	0.8
3344 Semiconductor & Comp. Mfg.	63	7.1	43.2	22.7
3345 Electronic Instrument Mfg.	30	3.1	12.1	4.8
3346 Magnetic Media Mfg.	9	1.3	4.9	2.1
3351 Electric Lighting Eq. Mfg.	16	1.4	5.9	2.0
3352 Household Appliance Mfg.	23	1.9	12.4	3.3
3353 Electrical Equipment	30	2.9	12.6	4.4
3359 Other Electrical Eq. & Comp. Mfg.	37	3.2	16.5	5.5
3361 Motor Vehicle Mfg.	38	4.3	75.7	6.5
3362 Motor Vehicle Body & Trailer Mfg.	23	1.5	7.3	1.5
3363 Motor Vehicle Parts Mfg.	123	9.4	64.2	9.6
3364 Aerospace Product & Parts Mfg.	6	0.7	2.9	0.7
3365 Railroad Rolling Mfg.	2	0.2	1.2	0.2
3366 Ship & Boat Building	13	0.8	3.8	0.9
3369 Other Transportation Eq. Mfg.	12	0.9	8.7	1.5
3371 Household & Institutional Furniture Mfg.	118	5.7	19.8	8.1
3372 Office Furniture & Fixtures Mfg.	6	0.3	1.6	0.6
3379 Other Furniture Related Mfg.	18	1.0	5.0	2.0
3391 Medical Eq. & Supplies Mfg.	108	9.1	28.1	18.0
3399 Other Misc. Mfg.	99	7.1	25.9	13.6
Total in Manufacturing	4,769	388.7	3,458.5	924.7



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Thomas Evans <Thomas.Evans.116806936@p2a.co>

Fri, Sep 21, 2018 at 4:24 PM

Reply-To: teevans71@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Thomas Evans
[16 Gra-Mar Ln](#)
[Stuarts Draft, VA 24477](#)

**Deny the Buckingham Compressor Station air permit**

1 message

Elise Evans <e.fay.evans@gmail.com>

Fri, Sep 21, 2018 at 8:50 PM

Reply-To: e.fay.evans@gmail.com

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

I respectfully urge you to deny the draft minor source air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station.

This compressor station poses a direct threat to our climate, our air quality, and - most importantly - to the lives of the historic freedman and largely African American Union Hill community. If built, the compressor station would emit methane, nitrogen oxides, volatile organic compounds and particulate matter into the air in close range to community members' homes and would be a stark example of environmental racism at play in the Commonwealth.

We ask that you deny this permit and request that the following concerns be addressed:

- DEQ and the Air Board must ensure that the permit for the Buckingham Compressor Station does not disproportionately impact marginalized communities. However, the vast majority of residents in close proximity to the proposed compressor station site - 85% - are people of color, and a large proportion are elderly or very young. Therefore, a disproportionate impact on an environmental justice community is virtually guaranteed. If the project cannot be modified to avoid this outcome, the air permit should be denied.
- ACP has not shown that the amount of toxic air emissions from the compressor will not cause or contribute to the endangerment of human health. DEQ should conduct a baseline Health Impact Assessment to better understand what ailments already exist in the community that could be exacerbated by these emissions. The elderly, very young, and community members who already have respiratory health issues are particularly at risk.
- DEQ should require ACP to continuously monitor nitrogen oxide emissions to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ should conduct further analysis of the greenhouse gas emissions associated with this proposed compressor station. While Virginia is poised to begin regulating carbon dioxide emissions from electric power plants, ignoring the greenhouse gas emissions from the infrastructure used to supply those power plants is self-defeating. With each new pipeline and compressor station built, significant amounts of methane are emitted into the atmosphere, exacerbating climate change impacts. Though methane does not last in the atmosphere nearly as long as carbon dioxide, methane is much more efficient at capturing radiation than carbon dioxide and, pound for pound, the comparative impacts of methane to carbon dioxide are 25 times greater over a 100 year period. Greenhouse gas emissions are mentioned in the draft air permit, but further analysis of impacts and plans to mitigate those emissions are necessary.
- ACP has not adequately addressed emergency response plans. Detailed plans should be drafted and shared with the community. These plans should outline evacuation and actions in response to an explosion or other emergency at the Buckingham compressor station. At this time, there is no certainty that residents could be evacuated promptly, and Buckingham County emergency responders do not have the supplies or resources to respond to a significant industrial emergency.

It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station. I urge you to deny the permit.

Sincerely,

Elise Evans
20700 Darnestown Rd
Dickerson, MD 20842
2407500819



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station Questions

1 message

Taylor Evans <evanstb611@gmail.com>

Fri, Sep 21, 2018 at 8:34 AM

To: airdivision1@deq.virginia.gov, michael.dowd@deq.virginia.gov, patrick.corbett@deq.virginia.gov

Dear Members of the Air Pollution Control Board,

I believe, based on the questions and information below, there strong evidence of environmental injustice related to VA ACP CS site. Thank you for taking the time to review the information and questions below:

The Environmental Justice Collaborative letter to Gov. Northam, Senators Warner and Kaine, Virginia State Legislators; cc: Federal Energy Regulatory Commissioners, Dominion Resources, and Meryem Karad, Trieste Longwood (DEQ) co-signed by 29 groups **describes why the comprehensive assessments must be undertaken immediately:**

“Environmental justice is falling through the cracks because each federal or state agency limits its permitting and regulatory authority to fragmented fields of expertise (air *or* water; air *not* safety or noise pollution).

This approach excludes comprehensive study of the cumulative risks and hazards faced by impacted residents, and supports denial of responsibility for environmental justice implementation. Thus, EJ communities remain targets for new burdens of toxic infrastructure in Virginia. Travesties in two of these communities [Union Hill, Buckingham, VA only VA ACP compressor station & Chesapeake communities impacted by ACP Connector Link] have prompted this letter and our strong recommendations for immediate actions by you” (9-10-18).

Mike Dowd, DEQ, Director, Division of Air and Renewable Energy, at the Buckingham public information meeting held on Aug. 16, 2018 responded to local representatives informing DEQ about the majority African American population of Union Hill, its residents’ former slave ancestry, and more, said that in our public comments about the air permit, DEQ will not consider environmental justice or site suitability; that site suitability is left up to the local government. (28:00)

Yet, it is the responsibility of the Air Pollution Control Board to consider site suitability:

“2010 Code of Virginia, Title 10.1 - CONSERVATION. Chapter 13 - Air Pollution Control Board (10.1-1300 thru 10.1-1328) § 10.1-1307. Further powers and duties of Board.

E. The Board in making regulations and in approving variances, control programs, or permits, and the courts in granting injunctive relief under the provisions of this chapter, **shall consider** facts and circumstances relevant to the reasonableness of the activity involved and the regulations proposed to control it, including:

1. The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused;
2. The social and economic value of the activity involved;
3. The suitability of the activity to the area in which it is located;”

Unsuitability of Union Hill, Buckingham VA as only ACP Virginia compressor station site

Dominion has consistently used misinformation about the factual population, race, and omission of historic cultural resources in submissions to Buckingham elected representatives, to FERC and DEQ.

Misinformation that erases the name of the community, denser populated numbers of people living in close proximity, majority African American race, and erasure of their Former Slave and Freedmen history (as well as former plantation history) has shaped decision-making at every level of ACP’s permit processes.

1. Dominion unfairly singled out Buckingham County from all counties along the three state route of ACP to claim it has “no historic resources” whether archaeological or architectural in that segment. Yet in all other

counties, completely similar resources of early and mid-20th Century and 19th Century homes, churches and their cemeteries, bridges, dilapidated farm structures and stores, etc. were listed and photographed for 1674 pages. Alone, Buckingham's history was/is denied and erased.

❖ In Sept. 18, 2016 ACP filed a 1674 page cultural resource application to FERC. For Buckingham County only, ACP had "no recorded resources identified within the modified project APE" (Appendix D: 31).

❖ In March 24, 2016, ACP filed their Addendum of cultural resources. In Appendix D on P. 31, for Buckingham ACP reports only "three [total] resources are "documented within the modified project APE include three single-family dwellings that range in date from circa 1940 to circa 1965 . . . They have no known association with a significant event or person and are not associated with any broad patterns in history."

Pp. 330, 331, and 332 are photos of that list of homes/addresses: 330 & 331 **are the same home/same photo. 332 is not in Union Hill.** L. Fjord identifies 330/331 – the only cultural resources listed for the whole county of Buckingham - as Theo Haskins' on S. James River Highway, an abandoned trailer next to a modular home, without the family cemetery that adjoins it.

❖ That is, Dominion's contractors had to visibly ignore 99 homes on all sides of the CS 2 site, 2 historic black churches and their cemeteries (Union Hill Baptist est 1868; Union Grove Missionary Baptist est. circa 1920); 1 historic white church and cemetery est. 1831, 2 historic black school sites, the 1880s Freedmen home place of the Harper family next to the proposed CS site, no photos of the Variety Shade tobacco barn or of Shelton Store, which is visible from the road in Union Hill.

❖ May 3, 2016, "Union Hill/Woods Corner Rural Historic District" Buckingham, VA was listed by Preservation Virginia as a "Most Endangered Historic Place" in Virginia.

Notification of that listing and its complex of historic resources, marked and unmarked slave burials, churches, cemeteries, former plantation sites, farm structures, homes, photographs, and slave plantation neighborhood history have been part of public record of comments made to the Buckingham Planning Commission, the Buckingham Board of Supervisors, to FERC, by Dr. Lakshmi Fjord, Justin Sarafin and Sonja Ingram of Preservation Virginia since August 2016.

2. Dominion knowingly erased the existence of Union Hill as a known community, and its 99 households visibly within 150ft – 1-mile radius on all sides of their ACP VA compressor station site. In their 2015 FERC application and in all local and state permit processes both written and submitted at public hearings, ACP used the 2010 census average person per square mile data for the whole of Buckingham County – 29.6 – to report the population for ACP CS 2.

❖ On May 30, 2018, the spokeswoman for Dominion to the Governor's Advisory Council on Environmental Justice claimed "it is the law" to do so -- when National Environmental Protection Act-NEPA guidelines state the opposite is true:

"The fact that census data can only be disaggregated to certain prescribed levels (e.g., census tracts, census blocks) suggests that pockets of minority or low-income communities, including those that may be experiencing disproportionately high and adverse effects, *may be missed in a traditional census tract-based analysis.*" **Caution is called for in using census data due to the possibility of distortion of population breakdowns** ... In addition to identifying the proportion of the population of individual census tracts that are composed of minority individuals, analysts should attempt to identify whether high concentration "pockets" of minority populations are evidenced in specific geographic areas. ... The IWG guidance also advises agencies not to 'artificially dilute or inflate' the affected minority population" (1997, 15-16).

❖ The Union door-to-door household study of Union Hill designed and conducted by Dr. Lakshmi Fjord (UVA, Dept. of Anthropology) began in August 2016 to uncover the actual 1-mile radius demographic and historic data for the CS 2 site has had 3 stages for a total of 4 months, and ending Sept. 4, 2018. The study follows NIH protocols for health information confidentiality, and

community research guidelines. Open-ended interviews of 1-1.5 hours took place in 67 of the 75 households reached. Data includes: factual population, race, ages, pre-existing diagnosed health conditions, family heritage in Union Hill and nearby, and existing economic or food source uses of their land.

ACP's Buckingham CS site map found at dom.com, with a layer of household addresses added by Southern Environmental Law Center based on USPS postal addresses, proves that Dominion always knew and could submit accurately that CS is not "sparsely populated," is not 29.6 people per square mile.

❖ There are many cost benefits to Dominion to erase the population of Union Hill. By contravening NEPA guidelines, FERC in ACP's Final Environmental Impact Statement-FEIS reports no environmental justice issues besides low-income for the entire ACP route, which includes Union Hill-sited CS 2 (FEIS 4.9.9.1 Demographic and Economic Data, Vol 4-512). FERC notes their concerns if there were an African American majority population at this site:

 Macintosh HD:Users:lakshmifjord:Desktop:Union Hill Household Map.png

"As discussed in section 4.11.1, air pollutants associated with ACP and SHP include increased dust as a result of construction equipment and vehicles, and compressor station emissions, which include carbon monoxide (CO), carbon dioxide (CO₂), methane, and nitrous oxide (NO_x); volatile organic compounds (VOCs); and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns (PM_{2.5}). These air pollutants are known to increase the effects of asthma³¹ and may increase the risk of lung cancer (Nafstad et al., 2003).

Due to high rates of asthma within the overall African American community, we consider this community especially sensitive" (FEIS Vol 4:512)

❖ Union Hill household data including revised population, race, and existing diagnostic health conditions, is in the public record to Buckingham elected representatives, 2016-17; to FERC in EIS public comments by Dr. Fjord and by Southern Environmental Law Center (SELC), 2017; by Dr. Fjord in 401 Water permit comments and NW12 Water Board comments, 2017-18.

❖ Updated household data (Sept. 3, 2018 updates):

- 75 of 99 households reached for a 76.5% response rate, an outstanding rate in social science research.
- 199 weekday residents; with hundreds more on weekends, bimonthly, etc.
- 83% are minorities: African American, Native American/African American, Native American/White, Hispanic, and Asian
- 17% are White
- Children 0-17 are 32%; Elderly are 25%
- For 67 households, we have listed in the table existing diagnosed health conditions that would be impacted by the combination of emissions applied for at BCS, including particulate matter, radon, volatile organic compounds, and list of EPA emissions DEQ lists in their draft air permit for ACP.
- Known pre-existing diagnoses at Union Hill, include diabetes, asthma and other lung conditions, chronic bronchitis and pneumonia, heart conditions, breast and other cancers, COPD, lupus, kidney disease, epilepsy, multiple sclerosis, brain tumor, migraines from 35 households in our study who responded to this pre-existing health conditions question.

3. The Air Pollution Control Board must consider that so far at the local and state level no "site suitability" study and accurate report has been placed in the public record by Dominion for Union Hill CS 2 compressor station. At every phase of the application process, Dominion has been allowed by

Buckingham Board of Supervisors, by FERC, and DEQ to perpetuate the myth that BCS is a “sparsely populated” place when it serves them:

- i. to compressor stations 200 miles apart, non-industry standard;
- ii. to have shut off valve distances at 15.7 miles apart at this site, which is not Pipeline Hazard and Safety Administration Agency standards for this population size;
- iii. to allow highest PSIS of pressure at this site;
- iv. to locate the intersection of the existing 4-pipeline Transco corridor with the new ACP pipeline in the middle of a huge wetlands;
- v. where 100% of the drinking water is from that shard aquifer, through individual water wells;
- vi. where A1 agricultural zoning was exempted for heavy toxic polluting new industrials complex;
- vii. where there is no industrial use, yet claimed to be so when ACP and FERC noted “visibility issues” with this complex;
- viii. where there is scarce internet access, yet ACP will build a 125ft. wifi tower and not grant community requests for access to wifi as the only community benefit;

Most egregiously, ACP’s application, the local Board of Supervisors, and DEQ have allowed Dominion to:

- ❖ Erases impacts on a minority community, and its particular and now rare in Virginia historic Freedmen community still living where their ancestors were enslaved;
- ❖ Erased that history in its cultural resource report, **only filed after Advisory Council on Historic Preservation (ACHP) wrote a rare comment of concern** about that complete omission to FERC;
- ❖ Erases need for closer study of the health impacts on this minority community which FERC in its ACP FEIS states would be concerned if BCS were a majority African American community. “ But, FERC stated it is not, using ACP’s census data not the expert data submitted by Dr. Fjord and SELC on actual population;
- ❖ 29.6 persons per square mile allow Dominion to have 75% thinner pipes and up to 500% longer shut off valve distances. For the BCS, FERC FEIS states valve distances are 15.6 miles apart vs. 2 miles for most populated areas. These benefits to the developer at the expense of impacted residents must not go on.

Site Suitability for the BCS, must now be the responsibility of the Air Control Board and the Governor because of the slave plantation legacy in Buckingham.

- ❖ The local Board of Supervisors accepted ACP flawed and incomplete information for the special use permit. Of 91 comments, 87 were against, 4 in favor; Board voted to approve.
- ❖ Deliberate erasure of Buckingham Slave history began in 1869 when vigilantes burnt the courthouse to destroy records of enslavement, fearing Buckingham’s 2:1 majority former slaves’ voting for restitution.
- ❖ In ACP process, African Americans who spoke out against the special use permit have faced reprisals.

DEQ Air and Renewable Energy Director, Mike Dowd, disagreed with FERC’s finding that if Union Hill were populous and a minority community it *would matter* to accepting ACP’s application for BCS site. At the Buckingham air permit public info session, Mr. Dowd stated that “population size” doesn’t matter because all emissions are below EPA standards in this draft air permit. DEQ staff reported having worked hard to research and insist on technology changes to fix this “only time DEQ failed an air permit by a developer,” according to Mr. Dowd.

Who receives DEQ paid staff expertise support and clear imbalance in who and what “counts” as expertise:

1. We ask DEQ and the Air Control Board to spend equivalent amounts of taxpayer funded expert DEQ staff time to work directly with the experts that provide creditable evidence against granting the air permit in the 30-day public comment period. For this and community-based comments’ reasons, the Board really needs to extend **the public comment period by at least 30 days.**

- ❖ Professionals in environmental health, science, and community-based household research provide key facts and omissions necessary for a true DEQ assessment of any and all air-related hazards. We have not yet seen DEQ accept this expertise in Dominion’s ACP permitting process.

- ❖ Dominion is being cited over and over for Incorrect, incomplete, and even shoddy work even by DEQ staff in ACP’s draft air permit or by ACHP in their historic cultural resource report for Union Hill, yet their incomplete and inaccurate information is accepted by FERC and DEQ even when it shapes yes/no decision-making. Why?

- ❖ Experts who offer factual information who are not paid for by Virginia taxpayers or by the developer are not given “expert status” by DEQ permit granting bodies. Why?

- ❖ Friends of Buckingham has ensured that our baseline testing of existing ambient air conditions and individual well-water testing in Union Hill tests as full a range of the contaminants found at CS sites from independent studies; and we use Virginia certified labs. Why is Dominion allowed to use non-certified labs and not required to test that range of contaminants?

Comments and data submitted to DEQ and Virginia Water Control Board by Dr. Lakshmi Fjord

Why BCS must have a full CHIA (Comprehensive Health Impact Assessment): pre-existing conditions in Union Hill community call for environmental justice study of minority health impacts. Where are the studies to assure that the passage of the Transco Pipeline through this portion of Buckingham is not contributing to these medical conditions?

We refer the DEQ and Air Control Board to Dr. Larysa Dyrszka’s expert comment already filed within the public comment period. Of which these are the key points:

2. The [Shale Health Impact Assessment \(HIA\) Template](#) is designed to give a structured way to bring together data on the community potentially impacted, the expected emissions from shale gas or oil development, and the potential health risks posed to residents in the immediate area. This tool can provide decision-makers with a comprehensive perspective on the siting, expanding, or maintaining of a shale gas or oil compressor station.

3. A “tons per year” measurement associated with the assessment of risk to the public’s health near a compressor station is an archaic method, and does not address exposure adequately. Also, the National Ambient Air Quality Standards (NAAQS) used as a benchmark for air quality were not created to assess the air quality and safety in a small geographic area with fluctuating emissions. NAAQS effectively address regional air quality concerns. **But these standards do not adequately assess risk to human health for residents living in close proximity to polluting sources such as compressor station sites, where emissions can be highly variable.**

4. Thus, **There are concerns about the adequacy and quality of the air modeling study:**

- ❖ Current protocols used for assessing compliance with ambient air standards do not adequately determine the intensity, frequency or durations of the actual human exposures to the mixtures of toxic materials released regularly at compressor stations.
- ❖ The typically used periodic 24-hour average measures can underestimate actual exposures by an order of magnitude. There remains the risk of serious harm to human health, including lung disease.
- ❖ Reference standards are set in a form that inaccurately determines health risk because they do not fully consider the potential synergistic combinations of toxic air emissions. Thus estimates of yearly totals of contaminants released by a compressor station do not allow for an assessment of the physiological impact of those emissions on individuals. NAAQS reflects what, over a region, over time, is deemed safe population- wide. This is very different than what is safe within for instance 1200 feet of this compressor station. Averaging over a year can wash out important higher spikes in emissions (thus exposures) that may occur at various points throughout the year.
- ❖ What is needed is continuous, minute-by-minute data on a suite of surrogate compounds being emitted.

5. Health risks from relevant air contaminants receive inadequate treatment.

- ❖ From studies of compressor stations that “met” NAAQ standards, the following problems were notated: health impacts from hydrogen sulfide, PM_{2.5} or carbonyls.
- ❖ Hydrogen sulfide was monitored continuously, documenting the variability of potential exposures, along with the average. Spikes of H₂S were quite high. Southwest Pennsylvania Environmental Health Study (SWP-EHP) has similar findings from measurements of PM_{2.5} near compressor stations. Particulate matter is not included in DEQ concerns, yet must be.
- ❖ There are other levels and types exposure around compressor stations that raise health concerns. In particular, acetaldehyde, benzene, formaldehyde, carbon tetrachloride, chloroform, 1,2-DCA and 1,1,2-trichloroethane, crotonaldehyde, and 1-methoxy-2-propanone exceeded their respective comparison values (CVs).
- ❖ Mixtures of pollutants are a critically important topic in addressing the public health implications of compressor stations. In fact, a very large number of chemicals are released together. NAAQ and Medical reference values are not able to take the complex nature of the shale environment, its multiple emissions and interactions into full consideration. Some mixtures like particular matter (PM) and volatile organic compounds (VOC) act synergistically to increase the toxicity of the chemicals.

6. The air permit treatment of Particulate Matter (PM) impacts in particular, but also of health impacts from compressors in general, is inadequate

- ❖ Particulate matter is known to impair lung function, aggravate asthma, cause high blood pressure and heart attack. PM can adhere with other compounds and then can carry these compounds, which may be toxic, into the deep lung and this is a health concern near compressor stations where multiple toxins are emitted with particulate matter (PM).
- ❖ Why is DEQ not adequately considering particulate matter, which will also be produced during the construction period, as well as daily during operations of BCS?
- ❖ Given that particulate matter (PM) causes respiratory damage and there are technologies available to scrub PM from air emissions, how can Dominion claim best available technology

(BACT) if not scrubbing PM?

12. Radioactive waste is not considered in ACP air permit, why not?

❖ **EPA region 3 reports that radium, measured as gross alpha and beta, in flowback water and produced waste in Pennsylvania wells, is significantly higher than in other shales.**

❖ Graphs found in Dr. Dyrszka's comment -- from a USGS report -- illustrate the high radioactivity in Marcellus shale.

❖ Radon selectively and preferentially travel with the gas product, namely radon. As radon decays within the pipeline, the solid daughter elements, polonium and lead, accumulate along the interior of the pipes. There is a concern that the gas **transiting, and being compressed and regulated, will have radioactivity levels** which will put at risk not only the workers at these stations and along the pipeline, but potentially also to the residents. Radon, a gas, has a short half-life (3.8 days) but its progeny are lead and polonium, and these are toxic and have relatively long half-lives of 22.6 years and 138 days respectively.

❖ This air permit modeling does not address the potential health risks of the radon decay progeny.

13. Sulphur Oxides and Hazardous Air Pollutants (HAPs) emissions seem to be higher in the 2018 permit application when compared to 2017 estimates. How can Dominion claim best available technology (BACT) if they have selected new equipment that allows increases in these dangerous emissions?

14. Dominion's claim of best available technology (BACT) seems to involve selective capturing of methane, so how could DEQ assure these levels are lower to protect our health and reduce threats from climate change?

❖ Since climate change drilled down is daily and episodic direct impact from methane emitted -- plus all the other pollutants applied to for emission at CS #2, as they are breathed and drunk in water taken from 100% single source individual wells next to the CS #2 site?

❖ Methane is 86% more damaging to protective ozone than carbon dioxide. How does DEQ plan to require Dominion to accurately measure as well as to eliminate the release of methane into our community?

15. Insufficient information about direction of air emissions based on actual site conditions, rather than lab testing must be addressed

❖ Close by residents and those many miles away face new sources of large emissions that do have health impacts whether cumulative or by mixture.

❖ There air modeling done in laboratories have not been made clear enough to provide indicators of seasonal or daily peak exposures or minute by minute exposures based on geography.

❖ Many of our schools are within 10 miles of the compressor station. How will our children be protected?

❖ While baseline emission data from Roanoke, Hopewell, and other parts of the state might provide the best available baselines for air modeling, how can we be assured of the accuracy of pollution estimates, when the characteristics of these places are clearly different from

Buckingham and DEQ is basing the majority of these pollution estimates on unverified-in-real-life modeling outputs and laboratory testing?

❖ DEQ air modeling for the BCS is based on many assumptions about temperature, altitude, and other factors that are not accurate for Buckingham. Why was field data not collected? How can you assure test results and thus pollution estimates are accurate?

❖ How do you adjust for seasonal variability when assessing impacts of toxic pollutants on human health? For example, how do you take into account the higher exposure level of emissions that occur during the colder months when they stay closer to the ground?

❖ The "emergency" gas turbine, which raises the combined horsepower closer to 57,000 is intended for winter months. How is this accounted for in the air permit? Can we be assured that use of "emergency" is not being used to "hide" higher levels of emissions in winter

16. Please share with us the data **documenting the current ambient air quality**. What is the difference between **the ambient air quality now in the air** around the proposed project and what ACP applies to add to BCS site's present "higher than normal" air quality (quotation from ACP's "failed air permit"?)

17. **ACP compressor stations do not follow industry standard for spacing:** Since the recommended distance between compressor stations is usually less than 100 miles, why is the distance between ACP compressors so great, particularly since it concentrates dangerous pollution in the Union Hill and Woods Corner neighborhoods?

❖ Given that industry standard is to have compressor stations at shorter intervals, distributing risks and hazards more evenly over transmission distances. How does ACP explain that they have only one compressor station per state, and therefore these are very large and impactful as needed to provide the pressure to cover 200+ miles between CS #1 and CS #2 and CS #2 and CS #3?

❖ Given Dominion's past actions in other locations, we can anticipate that this compressor station will be expanded in the future. Unless the company can be prohibited from expanding in the future, why is this facility not considered a major source of pollution now so stronger standards are applied?

18. **Who Pays the true costs of these harmful emissions on health?** If community members get sick as a result of toxic emissions from the compressor station like formaldehyde, benzene, and hexane, would they be forced to sign non-disclosure agreements before receiving help with medical bills from Dominion Energy or Williams Transcontinental (Transco)?

19. **DEQ must require Dominion provides warnings for scheduled blowdowns.** How will nearby residents who have health issues be given sufficient time to leave the area until the pollutants are reduced? How long will they have to plan to be away from the area to protect their health? What conditions might affect that time?

20. Does DEQ plan to establish fence line monitoring systems to notify local residents when air pollutions levels from BCS are unsafe?

Local Emergency Response Capacity – it matters to emissions issues

21. We are worried about the inadequacy of local emergency response services in Buckingham and the highly pressurized, toxic, explosive, and flammable nature of the materials at BCS and in other ACP infrastructure. How will the state assure the safety of local residents?

22. How will Dominion use local knowledge of limitations in emergency response to make our system more robust? How can we be assured Dominion will not be allowed to set a standardized evacuation process that does not fit our local challenges and characteristics?

23. Many compressor stations start without clear evaluations plans. We know people currently living with compressor stations that have no local emergency plans. FERC does not enforce their provision. What steps can we take if Dominion Energy's promised evacuation plans are inadequate to assure public safety?

New Technology promises without warranty

24. The SOLAR manufacturer does not warranty or guaranty emission reductions in real life will approach levels found in modeling tests. SOLAR suggests any estimates must be treated as a range contingent on local variables. Given this careful language and the direct precaution in the SOLAR's sales materials warning against using their estimates in permitting decisions, why has there not been additional independent verification to assure estimates are accurate for Buckingham's local conditions?

25. **Since the new "green" technology Dominion bases their predicted emissions on has never been tested in the field and is taken from manufacturers' laboratory results** under generic conditions, is it not the best practice to hold the air permit application until the new technology has been tested in similar situations? For example, some of the proposed emissions controls have only been used with small turbines dissimilar to those proposed for BCS, isn't additional testing and use required before we can trust the manufacturer's claims?

❖ **Isn't a minority, environmental justice community going to be the guinea pig** for DEQ's hoped for new R&D put to use by Dominion?

❖

Increased Gas transmission and emissions without community knowledge?

26. Could ACP increase the amount of gas compressed in the BCS in the future without additional air permitting?

27. Can increases in Transco gas compression in Buckingham move through the compressor without being regulated in an air permit?

28. Would impacted residents be consulted prior to future decisions about increases in gas transportation through the BCS or can DEQ approve increases without community knowledge or input?

Southern Environmental Law Center (SELC) Technical Comment Points:

- DEQ did not apply the best available control technology ("BACT") requirement correctly because neither ACP nor DEQ ensured that the nitrogen oxide emission limit set in the draft permit achieved the maximum reduction feasible. The currently proposed reduction in nitrogen oxide emissions is 58%, but more significant emissions reductions are achievable and cost effective.
- Limiting nitrogen oxide pollution is essential for human health. According to the EPA, breathing air with a high concentration of nitrogen oxides can cause irritation in the human respiratory system. Nitrogen dioxide—along with other nitrogen oxides—react with chemicals in the air to form particulate matter and ozone. Both of these are also harmful to the human respiratory system.
- Longer-term exposures to elevated concentrations of nitrogen oxides may contribute to the development of asthma and can increase a person's susceptibility to respiratory infections. People with asthma, as well as children and the elderly, are generally at greater risk for these health effects.

- DEQ should require ACP to continuously monitor nitrogen oxide emissions from the compressor turbines. This is necessary to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ did not ensure compliance with 9VAC 5-80-1180 because it relied on flawed ambient air quality modeling. The flaws in the modeling include a failure to use the highest allowable emissions rates, failure to account for emissions in very cold conditions when nitrogen oxide rates are expected to increase significantly, and understating emissions during startup and shutdown. Therefore, DEQ did not ensure the compressor station could operate without preventing or interfering with the attainment or maintenance of any applicable ambient air quality standard and without causing or exacerbating a violation of any applicable ambient air quality standard.
- It is important for DEQ to set appropriate, enforceable one-hour limits in the permit. Short-term exposure to high concentrations of nitrogen oxides are especially harmful to people with chronic respiratory conditions. Such exposures over short periods tend to aggravate respiratory diseases, particularly asthma, leading to often severe respiratory symptoms.
- ACP has not shown that the amount of toxic pollution emissions from the compressor will not cause or contribute to the endangerment of human health because ACP's modeling for formaldehyde and hexane emissions is flawed. Therefore, DEQ cannot, based on the information ACP provided, ensure that the compressor station will not cause, or contribute to, the endangerment of human health. According to the EPA, "formaldehyde can cause irritation of the skin, eyes, nose, and throat. High levels of exposure may cause some types of cancers."
- DEQ should impose an ammonia limit in the permit for the compressor turbines. Currently, no such limit exists.

Community Concerns that are not directly applicable to the draft air permit

Recordkeeping and Transparency

29. How can we access data/record-keeping on an ongoing basis to ensure the records that are being kept and so that we can be aware of the accurate quantities of emissions we are being exposed to daily, monthly and yearly?

30. How will we know all of the relevant information is being shared with the public in a timely manner? We know that in the past polluting companies and state agencies have a checkered history in terms of transparency.

31. Why is the public hearing for this permit being held on the last day of the comment period? This prevents anyone who attends and learns more from making a comment. It also prevents citizens who need time to consider new information from responding after they have time to do this.

Staffing/Security

32. Given that wi-fi transmission is unreliable in Buckingham, how can Dominion claim use of best available technology (BACT)? Fibre optic cables are the proven best current technology. What can be done to increase security of remote control of BCS from West Virginia?

33. We have received conflicting information about 24/7 staffing of BSC for onsite real-time data collection & monitoring during the life of the compressor station. Will there always be staff on site, even on weekends, holidays, and after the first year? It was made clear at the Q&A that there would be an in-person walk through required everyday even past the first year of operation. We request that this be written into the permit.

34. Can the APCB approve the permit when there does not appear to be a Special Use Permit (SUP) for the stacks?

--

Taylor Evans



Deny the Buckingham Compressor Station air permit

1 message

Kate Fagan <Kate@dancingbearmail.com>

Fri, Sep 21, 2018 at 7:28 AM

Reply-To: Kate@dancingbearmail.com

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

I respectfully urge you to deny the draft minor source air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station.

This compressor station poses a direct threat to our climate, our air quality, and - most importantly - to the lives of the historic freedman and largely African American Union Hill community. If built, the compressor station would emit methane, nitrogen oxides, volatile organic compounds and particulate matter into the air in close range to community members' homes and would be a stark example of environmental racism at play in the Commonwealth.

We ask that you deny this permit and request that the following concerns be addressed:

- DEQ and the Air Board must ensure that the permit for the Buckingham Compressor Station does not disproportionately impact marginalized communities. However, the vast majority of residents in close proximity to the proposed compressor station site - 85% - are people of color, and a large proportion are elderly or very young. Therefore, a disproportionate impact on an environmental justice community is virtually guaranteed. If the project cannot be modified to avoid this outcome, the air permit should be denied.
- ACP has not shown that the amount of toxic air emissions from the compressor will not cause or contribute to the endangerment of human health. DEQ should conduct a baseline Health Impact Assessment to better understand what ailments already exist in the community that could be exacerbated by these emissions. The elderly, very young, and community members who already have respiratory health issues are particularly at risk.
- DEQ should require ACP to continuously monitor nitrogen oxide emissions to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ should conduct further analysis of the greenhouse gas emissions associated with this proposed compressor station. While Virginia is poised to begin regulating carbon dioxide emissions from electric power plants, ignoring the greenhouse gas emissions from the infrastructure used to supply those power plants is self-defeating. With each new pipeline and compressor station built, significant amounts of methane are emitted into the atmosphere, exacerbating climate change impacts. Though methane does not last in the atmosphere nearly as long as carbon dioxide, methane is much more efficient at capturing radiation than carbon dioxide and, pound for pound, the comparative impacts of methane to carbon dioxide are 25 times greater over a 100 year period. Greenhouse gas emissions are mentioned in the draft air permit, but further analysis of impacts and plans to mitigate those emissions are necessary.
- ACP has not adequately addressed emergency response plans. Detailed plans should be drafted and shared with the community. These plans should outline evacuation and actions in response to an explosion or other emergency at the Buckingham compressor station. At this time, there is no certainty that residents could be evacuated promptly, and Buckingham County emergency responders do not have the supplies or resources to respond to a significant industrial emergency.

It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station. I urge you to deny the permit.

Sincerely,

Kate Fagan
Burlington ave
St pete, FL 33710
7274180243



Air Division 1, rr <airdivision1@deq.virginia.gov>

BSC air permit public comment

1 message

Finley-Brook, Mary <mbrook@richmond.edu>

Fri, Sep 21, 2018 at 4:59 PM

To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>

Please find attached.

Mary Finley-Brook

Associate Professor of Geography

#310 Carole Weinstein International Center University of Richmond Richmond VA, 23173

(804) 287-6307



public comment MFB Sept 21 2018 BCS.pdf
1678K

Piedmont Regional Office
RE: Buckingham Compressor Station
4949-A Cox Rd
Glen Allen, VA 23060

E-mail: airdivision1@deq.virginia.gov

Fax: (804) 527-5106

PERMIT NAME:

- Minor Source Construction Permit issued under the authority of the Air Pollution Control Board

APPLICANT NAME AND REGISTRATION NUMBER:

- Atlantic Coast Pipeline, LLC; 21599

FACILITY NAME AND ADDRESS:

- ACP – Dominion Energy Buckingham Compressor Station; 5297 S. James River Hwy, Wingina, VA 24599

Dear Air Pollution Control Board and State Regulators,

I am writing you as a faculty member at the University of Richmond in the Environmental Studies Program and as a member of the Governor's Advisory Council on Environmental Justice (ACEJ). I have spent the past nine months conducting intense environmental and social impact review of the Atlantic Coast Pipeline (ACP)-Dominion Energy Buckingham Compressor Station permitting process. I have reviewed environmental and social impacts of development projects for more than two decades and have focused specifically on energy projects sited in low income and minority areas for the past decade.

Environmental racism

I have observed the situation in Buckingham for the past four years since the ACP proposal. My engagement increased after ACEJ was contacted in March of 2018 by the impacted Union Hill community, Friends of Buckingham, and Yogaville. We created a Pipeline Subcommittee to investigate allegations of environmental racism in Buckingham and at other points along the route of the ACP and the Mountain Valley Pipeline. ACEJ found ample evidence of racial discrimination and documented this in a recent letter to Governor Northam (see Appendix 1 attached to this letter). ACEJ members from across the state reached consensus before expressing our concerns to the Governor. We spoke to impacted residents on various occasions and received hundreds of pages of documentation to support our extremely grave findings.

The proposed compressor station is sited in a historic Freedman community with many families directly descended from enslaved peoples who worked in the tobacco plantation and who have maintained ongoing and direct ties to Union Hill. The erasure of hundreds of African American Union Hill residents from project assessments first by the Federal Energy Regulatory Commission (FERC) and then by Virginian state agencies provides a faulty foundation for the entire permitting process.

Environmental justice in federal and state policies

The Environmental Protection Agency defines Environmental Justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The term has its roots in Civil Rights law, specifically Title VI of the 1964 Civil Rights Act.

Federal policy

The first three elements of Executive Order 12898 of February 11, 1994 on Environmental Justice are (1) to promote enforcement of all health and environmental statutes in areas with minority populations and low-income populations; (2) to ensure greater public participation; and (3) to improve research and data collection relating to the health of and environment of minority populations and low-income populations. This comment and dozens of others submitted about this same compressor station discuss how these three points have not occurred in Buckingham prior to and during the permitting process.

State policy

The situation in Union Hill is in direct contrast to the stated objectives of state leaders during the creation of ACEJ. Executive Order 73 states, “The Commonwealth requires a consistent, action-oriented approach to incorporating environmental justice into decision-making.”

Under energy objectives, the Code of Virginia, (Title 67. Virginia Energy Plan, Chapter 1. Energy Policy of the Commonwealth § 67-101) seeks to develop “energy resources and facilities in a manner that does not impose a disproportionate adverse impact on economically disadvantaged or minority communities.”

It would be in violation of this code if the state were to risk the lives of Union Hill residents with high-pressure and potentially explosive infrastructure. Hundreds of vulnerable residents live within 2-mile blast zone. There is no evacuation plan and there has been inadequate attention to the need for emergency responders. Hospitals are located more than an hour away.

Inadequacy of the 30-day comment period

My research over the past two decades has focused on site review of new energy infrastructure. In particular, my specialty is to assess the involvement of impacted communities, a key stakeholder group. For this reason, I will draw your attention to the September 2018 Resolution of the ACEJ, submitted to Governor Northam (see [Appendix 2](#)), reinforcing the community’s request for a 60-day total public comment period. The Governor’s Advisory Council heard arguments from the impacted community that included the following: 1) the rural location means there is inadequate access to internet to obtain project information, 2) due to a disproportionately high percentage of elderly residents in the direct vicinity, and their lack of experience reading air regulations, the technical nature of the air permit requires sufficient time for people to understand the specific details, 3) a printed copy of the air permit application was not made available in Buckingham until the review period was half over, and 4) local community organizations requested an extension with additional details on why more time was required.

Having spent many hours with impacted community members as they prepared comments, I confidently assert that the 30-day period is an insufficient amount of time for Union Hill. In my professional opinion, the pressure the 30-day period caused to a community already struggling to deal with the scope of this situation was highly inappropriate. I have seen elderly African American residents who live within one mile of the compressor station in tears while trying to prepare these comments. Retired individuals in their 70s would take materials home to study late into the night and come back again in frustration and despair having written pages of concerns but uncertain of how to word them so anyone would listen. In my presence, residents were informed by DEQ that if they did not word comments to address technical details and those considered relevant by DEQ that their comments would be marked as irrelevant and disregarded. I fear that the state is too distant to understand the degree of stress this process brought to this vulnerable community. The vast and broad concerns, some with potentially fatal consequences like fire and explosion, which keep impacted community members awake at night, should not be marked as irrelevant in the public commenting process because of the narrowness and fragmentation of state permitting authority. Community concerns never fit anywhere properly according to the state agencies we asked. If nearly all dire local concerns are repeatedly outside the scope of the state permitting authority, there is something wrong with the state regulatory process! After hitting walls for four years, residents from Buckingham decided to join with the Virginia Environmental Justice Collaborative, made up of 18 civil rights, environmental, community-based, and faith-based organizations from across the Commonwealth, to draft the following letter to federal, state, and local officials ([Appendix 3](#)). It highlighted the need for comprehensive and cumulative review sensitive to local culture and history. In particular, community members have repeatedly asked for Quantitative Risk Assessment (QRA) and Health Risk Assessment (HRA).

Impacted communities are constantly told they should do more or do things differently, while state agencies have many excuses explaining how they cannot help, do not have the resources, do not have the authority, do not have the time, do not have the specific expertise, etc. Due to budgetary constraints, state agencies are offloading environmental management duties on to citizens, non-governmental organizations, and volunteers such as myself without giving the respect, authority, or support necessary for us to be successful in protecting the environment. State agencies do not help provide enough technical support to regular citizens for them to defend their basic rights of clean air and water during permitting decisions.

DEQ and other state agencies needs greater parity in their technical support moving forward to achieve compliance with federal and state policy

The technical support provided to Buckingham was woefully inadequate. When residents asked DEQ technical questions at the one and only 'Question and Answer' session during the public comment period (and none had happened prior), they were frequently referred to the website without understanding of how unrealistic that is for an elderly resident who is not web literate and has very little experience navigating regulatory websites or understanding technical language. In our meeting site at the local church where we would work on writing comments, there is no web access due to the lack of internet service coverage in Buckingham. Residents could not look up information because of the state not making it available in a format appropriate to the local context. A printed copy should have been made available in the direct vicinity of the proposed compressor station as the dispersed geography of the county meant the one copy in the library was not enough.

There was insufficient access to technical experts from the state during four years of this permitting and particularly following the new 2018 permit application. Professionals willing to volunteer above and beyond other work commitments, such as myself, were the main technical support the community had. We were told yesterday in a meeting with nine DEQ representatives that this was the common route (i.e., offload technical support to the volunteer public, who often lacks the training necessary to work efficiently with the 275 different air regulations). This advice was given as we expressed how unjust the technical support process has been, with the permit-seeking firm gaining frequent access and the impacted community left without support. The professionals we spent hours identifying and we begging volunteer support from were often not able to find the time to help given the short window from the release to the public of the air permit application and the end of the public comment period.

In sum, in my professional opinion, based on many hours spent with local residents, state efforts were inadequate and the 30-day deadline was insensitive to local conditions and needs. The 30-day extension request from the community, backed by the ACEJ Resolution (Appendix 2), has been ignored. The lack of response to the 30-day extension paired with the lack of technical support seems to suggest state regulators either seek to limit community input or do not value local concerns. Even at the end of the 30-day period today, community members have more than 100 unanswered questions about the project (see Appendix 4).

ACP/Dominion Energy should notify local authorities prior to each venting event

Criteria pollutants are harmful at concentrations on time intervals that do not violate NAAQS.

Since residents have pre-existing conditions, such as respiratory disease, they will need to be more careful about exposure to venting episodes than the average healthy population upon which NAAQS were set. Unless DEQ can guarantee that they have done comprehensive and cumulative impacts from multiple exposures across time, they should treat each and all exposure in minority areas and low-income areas as dangerous. Until the state can have permitting and regulation match real air pollution exposures, which intersperse even when they come from different sources and different permits and which involve chemical reactions between different releases, the state needs to use the most basic element of environmental protection, that of the precautionary principle. Since environmental cleanup is much more expensive than prevention, then we should act on the side of caution. Many of the residents of Union Hill have respiratory illnesses already, suggesting existing exposures. If DEQ cannot prove that cumulative and comprehensive impacts of all combined exposures over time are safe for the elderly, young, and otherwise vulnerable populations of the proximate neighborhoods, the prudent decision would be to reject the permit. Similarly, unless DEQ can prove methane does not contribute to climate change, the prudent decision would be to reject methane releasing infrastructure like the ACP and the Union Hill Compressor Station.

If permitting is still considered, even though it is not prudent in this location, the next best practice would be to treat every blowdown like a high risk episode because of the vulnerability of the 99 households in the 1.1 mile radius. Best practice (like DEQ's technical BACT goals) would be to create a system of notification and a system of fence line monitoring.

Monitoring and compliance must occur for the full life of the project

The Union Hill Compressor Station air permit involves experimentation with relatively unproven technology, so additional evaluation and monitoring is necessary. I have heard with my own ears on multiple occasions DEQ air permitting staff state that Dominion Energy was not prepared with their permit applications and that they needed teaching to prepare this proposal. What guarantee does the community have moving forward that this teaching of the permit writers will continue as company practice in the Union Hill Compressor Station? If the company was not prepared to write an environmentally sound proposal without the support of DEQ, this is further evidence that monitoring and compliance needs to be stringent. Self-reporting should be monitored, reporting metrics must be regular and frequent enough to catch errors or gaps, and compliance monitoring and reporting must continue for the entire lifespan of the compressor station (i.e., through decommissioning of infrastructure and disposal of all materials and wastes from the site).

Under pressure from the community to address the lack of evacuation plan or details about safety risks, company representatives have suggested different possibilities for short-term oversight (i.e., only the first year). Currently they are suggesting they might cover first responders only for the first 7-10 years. Along with safety protections, monitoring and compliance are necessary for the full lifespan of the project. First, older and aging facilities have additional risks, so ending safeguards while the plant is still in operation would be negligent. Second, it is inappropriate for a powerful company to be negotiating with a relatively powerless community over the terms of emergency support, particularly since this negotiation is occurring with a few individual leaders in closed-door settings and private secret meetings. Without legal or technical support, leaders are being encouraged by Dominion Energy representative Basil Gooden to act quickly, followed with an assertion that they risk not getting anything if they do not act now. This is the type of pattern I document regularly in energy projects in developing countries with weak democracies. It is alarming to hear regular eyewitness accounts of such practices occurring in the Commonwealth of Virginia and in the United States of America.

Safety monitoring and compliance needs to include the full scope of the project and cannot fragment permitting of NAAQS or of methane or any other ecological, social, or cultural impacts

This compressor station air permitting is fragmented, which makes each decision only partially accurate, as also occurs with water permitting and other related aspects. Ecological damage and health risks in marginalized communities fall through the regulatory cracks in Virginia constantly. Similarly, state resources tend not to be directed toward preserving rural African American history sites without name recognition, such as the slave burial grounds in Union Hill. I have seen with my own eyes hundreds of graves that lack historical preservation. Until Virginian officials and agencies admit how much they are missing in their official and formal assessments, Union Hill Freedmen descendants will continue to experience oppression that never ended with the emaciation of their ancestors from slavery. Oppression continues with institutionalized and systemic racism.

Compliance monitoring requires the involvement of the community

Union Hill compressor station provides a watershed moment. DEQ air permit staff seems to want to increase community involvement moving forward. As someone who studies environmental behavior, I can confidently assert that both the literature and my years of experience clearly demonstrate hands-on and direct involvement in environmental management decisions is an excellent means for educating citizens and motivating on-going engagement and action. Informed and empowered citizen who are involved in their local communities will continue to advance DEQ's goal of environmental protection.

Broad community involvement in monitoring improves protection, but it is also necessary to institutionalize with transparency because of the direct actions by Dominion Energy in this community for the past four years. This week, through their paid representative, Basil Gooden, there are company efforts to limit involvement of local residents who allowed to give input on so-called economic development advisory group--shrinking from ten residents down to just six. This is in direct contradiction to DEQ and other state agency's calls for public input. Eyewitnesses tell me Gooden advises his selected community members to not ask for "too much" and suggests incentives like a hiking trail and a community center. In contrast, local residents have been inquiring about things like relocation or a paid settlement for those living within two miles.

Compliance best practice (on parity with attempts at BACT in the technical realm) would include 1) legal representation or at least legal counsel for impacted residents, and 2) monitoring and compliance guidance and coordination by Jerome Brooks (or another state agency Environmental Justice Coordinator). Given federal and state claims to advance environmental justice, it would be advisable to include one or more members of the National Environmental Justice Advisory Council (NEJAC) or state Advisory Council on Environmental Justice (ACEJ) in a support role.

If state environmental agencies are going to continue to be underfunded, there needs to be new forms of safeguards established. The privatization of safeguard roles gives more power to the private sector (i.e., the project owners and their tightly associated network of consultants). At the same time, reducing the oversight capacity of the state creates additional openings for environmental injustice. Cuts in DEQ's budget and reductions in staff are advancing discriminatory practices because they cannot add new air monitors (these historically have not been sited in communities of color) or new outreach, participation or education programs (these historically have not been sited in communities of color). At the same time, while there is recognition of to improve research and data collection relating to the health of and environment of minority populations and low-income populations, the state consistently argues they do not have the time or resources. Therefore, in this case, we see environmental racism not only in the siting of the compressor station creating disproportionate harm and risk for vulnerable and marginalized populations, but also in the unequal coverage of protective and preventative services and inequality in research and data collection.

The need for the ACP is in question

The need for the ACP is questioned by many economic and energy experts, particularly this past year. It seems likely this pipeline case, and the Union Hill Compressor Station as well, will be litigated for many years--with lawsuits challenging inadequate reviews before

permitting, racially motivated siting, and even the need for this new infrastructure given the number of other pipelines nearby. Lack of demonstrated need might advance climate change lawsuits, since this pipeline's methane unnecessarily harms youth and our planet's future.

Dr. Mary Finley-Brook
Associate Professor of Geography and Environmental Studies
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Richmond VA, 23173
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mbrook@richmond.edu

Appendix 1

To: Governor Northam
From: Advisory Council on Environmental Justice
Re: Environmental Justice Review of Virginia's Gas Infrastructure
Date: August 16, 2018

Dear Governor Northam:

The Advisory Council on Environmental Justice (ACEJ) was established to provide advice and recommendations to the Governor to improve equity in decision-making and improve public health in marginalized communities, among other goals listed in Executive Order 73 (EO 73) from October of 2017.¹ We appreciate the opportunity to communicate our first formal set of environmental justice concerns to the Executive Branch since our inauguration six months ago. Investigating and evaluating the proposed MVP and ACP pipeline and its' associated infrastructure has raised a myriad of issues (legal, scientific, technical, environmental, cultural, political, economic and social justice) that challenge our complete comprehension and integration. Consequently, we vigorously recommend the Governor use this situation as an opportunity to engage and encourage our state agencies to collaborate proactively to educate themselves and the public on the complex links and impacts of fossil fuel use on human health and quality of life. These links are many, both historic and current and the potential future impacts are likely to be felt most severely by our poor, minority and marginalized communities and community members. The people who have to live with the consequences of a decision should get to make that decision or at least have meaningful involvement in the decision-making process.

Historically the term environmental justice has meant ensuring that vulnerable populations including low income and/or minority populations are not disproportionately affected by environmental exposures that have known adverse effects. The Environmental Protection Agency defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The term has its roots in Civil Rights law, specifically Title VI of the 1964 Civil Rights Act, which prohibits discrimination on the basis of race, color, and national origin in programs and activities receiving federal financial assistance. For states like Virginia with significant diversity, it is necessary to examine the use of state-level policy mechanisms, such as eminent domain, to ensure their use does not result in discriminatory acts against its citizens.

The Council's examination of evidence submitted from the Union Hill in Buckingham County community has revealed to us that this community, like many others within the state,

¹ The duties of the Governor's Advisory Council are to provide advice and recommendations to the Executive Branch on the following: Integrating environmental justice considerations throughout the Commonwealth's programs, regulations, policies, and procedures; 2. Improving the environment and public health in communities disproportionately burdened by environmental pollution and risks; 3. Ensuring transparent, authentic, and equitable engagement in decision-making, building capacity in disproportionately burdened communities, and promoting collaborative problem-solving for issues involving environmental justice; 4. Strengthening partnerships on environmental justice among governmental agencies, including Federal, State, Tribal, and local governments; 5. Enhancing research and assessment approaches related to environmental justice; 6. Receiving comments, concerns, and recommendations from individuals throughout the Commonwealth; and 7. Developing resources and strategies to provide and disseminate information to the public. See <https://www.naturalresources.virginia.gov/media/governorvirginiagov/secretary-of-natural-resources/pdf/eo-73-establishment-of-an-advisory-council-on-environmental-justice.pdf>.

has a significant population fitting the environmental justice criteria. Many of Buckingham's residents, because of their race or color, have been the historical recipients of unequal treatment, for which the above-listed Executive Order was signed to serve as a remedy. Therefore, we encourage that these recommendations (and others that may be directed to the Governor from this Commission in the future) be viewed through this lens so that the state of Virginia can ensure policies, programs and practices will not have unintended consequences that harm citizens who have a history of disenfranchisement. Additionally, the Council recognizes the lack of bottom up participation and consultation among Virginia's Indigenous Peoples regarding "Free, Prior, and Informed Consent" (FPIC), as defined in the United Nation's Declaration on the Rights of Indigenous Peoples (UNDRIP) in 2007.²

In order to move Virginia forward ensuring its place as a leader in environmental justice, addressing the global climate crisis, and building a 21st Century clean energy economy we recommend that the governor direct state permitting agencies to prioritize renewable energy solutions, and quickly transition away from fossil fuels. The Governor's Advisory Council on Environmental Justice (ACEJ) recommends that the 401 Clean Water Act certifications for the Atlantic Coast Pipeline (ACP) and the Mountain Valley Pipeline (MVP) be rescinded immediately. Likewise ACEJ recommends that the Governor direct DEQ to suspend the permitting decision for the air permit for the Buckingham compressor station pending further review of the station's impacts on the health and the lives of those living in close proximity. We also recommend that a review of permitting policies and procedures take place and that the governor direct the Air Pollution Control Board, DEQ, and DMME to stay all further permits for ACP and MVP to ensure that predominately poor, indigenous, brown and/or black communities do not bear an unequal burden of environmental pollutants and life-altering disruptions. These actions would ensure that environmental justice has meaningful influence in all current and future energy projects.

Our concerns fall into seven areas:

- 1) Residents of Buckingham have provided comment to the Council that raise questions about the need for the pipeline given decreasing domestic demand
- 2) The Council recommends that if there is a change in demand that renewables be prioritized over natural gas.
- 3) Residents have provided comment to the Council about the potential for civil rights violations.
- 4) Union Hill Compressor Station in Buckingham County (ACP CS-2) may have a disproportionate impact on this predominately African American community and could be perceived as exhibiting racism in siting, zoning, and permitting decisions and public health risk;
- 5) Federal and state review of assessments of risk for cultural and historical resources as a result of the Mountain Valley Pipeline (MVP) and the Atlantic Coast Pipeline (ACP) are incomplete;
- 6) The Council has concluded that federal and state reviews of water quality risks from the MVP and the ACP have not adequately assessed potential impacts for vulnerable populations; and

² US support of UNDRIP was announced in 2010.
http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf.

- 7) Methane from gas infrastructure has the potential to contribute significantly to climate change at a time when Virginia's climate impacts are increasing clear and contribute to vulnerability and inequality.

TOPIC ONE: CONCERNS OVER CIVIL AND HUMAN RIGHTS VIOLATIONS

Energy development is possible without infringement of civil rights and human rights.³ It is our hope that our current energy systems will take into account vulnerable and marginalized communities who may be impacted by developments and that this will be influence when production, processing, and transportation projects are undertaken. Specific civil rights concerns for Union Hill (Buckingham County), in Native American territories, and in rural counties along the pipeline path, are discussed in detail in subsequent sections below.

A controversial aspect of pipeline construction in Virginia involves interpretation of public good for property takings under eminent domain. There is considerable activity in local, state and federal courts and examination of current policies appears necessary and should involve public input.

In counties with pipeline surveying and pre-construction, many property owners assert their property rights are violated and they are mistreated during forced entry. There are a growing evidence of stressful and sometimes traumatic encounters in recorded videos, photographs, and other documentation. There is also a lack of certainty about landowner rights, since eminent domain taking is negatively viewed by most landowners. Stress is amplified by concerns over property value and the potential for a negative impact on public health. Homeowners who may feel that their quality of life has been negatively impacted may be unable to find a buyer, if they wish to leave.

Recommendations:

- 1) We recommend that the Governor's office examine the role of state agencies to ensure that policies with the potential to negatively impact vulnerable communities take the health of those residents into consideration as policies are considered for implementation.

TOPIC TWO: PUBLIC HEALTH CONCERNS WITH COMPRESSOR STATIONS AND RACISM IN THE SITING DECISION FOR ACP CS-2 IN UNION HILL

ACP construction requires three compressor stations: one is located within Virginia and the other two are located near to the state's border. MVP construction has the potential to contribute additional emissions to the existing Transco Pipeline Zone 5 Compressor Station 165 in Pittsylvania County, Virginia.

³ Sovacool, B.K. and Dworkin, M.H. 2015. Energy justice: Conceptual insights and practical applications. *Applied Energy*. 142: 435-444.

The Council would like to highlight the potential for disproportionate impact for this community of Buckingham. For federal permitting, ACP used countywide statistics of 29.1 people per mile. We are informed by the community that nearly all the 99 households living within two miles of CS-2 were not taken into account within the FERC application. The majority (85%) of these households are African American, which is also much higher than the county average reported in the federal application. We believe these citizen concerns are warranted. Table 1 demonstrates annual releases from the proposed >53,000 horsepower compressor station, which would receive gas not only from the ACP, but also from the William's Transcontinental (Transco) Pipeline and its feeder lines. These emission levels are based on information available in the 2015 permit application and 2017 supplement. At the ACEJ meeting on May 30, 2018, we were informed of a new air permit application for ACP CS-2 for which the details were recently made available at:

<https://www.deq.virginia.gov/Programs/Air/BuckinghamCompressorStationAirPermit.aspx> a.

Impacted populations will need sufficient time to consider technical applications. During the 30-day comment period, if abundant public health concerns about emissions arise, the state should consider a delay in providing permits until an independent review can take places.

Table 1: Proposed Annual Releases from CS-2

Pollutant	Annual Air Releases Requested in the 2018 Air Permit Application	Public Health Implications of Pollutants (https://www.epa.gov/criteria-air-pollutants)
Nitrogen Oxides (NO_x)	43.4 tons	Inflammation of the airways, decreased lung function, increased risk of respiratory conditions, and increased response to allergens.
Carbon monoxide (CO)	51.6 tons	Vital organs, such as the brain, nervous tissues and the heart, do not receive enough oxygen to work properly; people have trouble concentrating, lose coordination, and feel tired.
Volatile Organic Compounds (VOCs)	7.69 tons	VOCs can irritate the eyes, nose and throat, can cause difficulty breathing and nausea, and can damage the central nervous system as well as other organs.
Particulate Matter (PM)	43.2 tons	Exposure to PM can lead to premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function growth, exacerbation of allergic symptoms, etc.
Sulphur Dioxide (SO_x)	8.30 tons	Exposure to SO ₂ can harm the human respiratory system and make breathing difficult; SO ₂ contributes to acid rain.
Carbon dioxide equivalent (CO₂e)	295,686 tons	Contribute to climate change with related health impacts, such as increases in distribution and/or intensity of mosquitoes and ticks, allergens, natural disasters, etc.
Methane	70.9 tons	Methane is a potent greenhouse gas; methane gas exposure can cause headaches, dizziness, weakness, nausea, vomiting, and loss of coordination.
Hazardous Air Pollutants (HAPs)	5.3 tons	More than 30 HAPs (e.g., arsenic, benzene, toluene, xylene, etc.) would be released from the proposed compressor station. The levels of formaldehyde and hexane are significant. Formaldehyde: irritation of the skin, eyes, nose, and throat. High levels of exposure may cause some types of cancers. Hexane: dermatitis

		and irritation of the eyes and throat occur with acute and ongoing exposure
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State decisions for infrastructure with significant social and ecological risks, like compressor stations, should not be made hastily, particularly in places like Union Hill where the everyday experiences of residents are shaped by historical experience of racial injustice for a population whose ancestry is rooted in slavery.

During public testimony provided by Buckingham residents, the potential benefits to landowners of the compressor station site when contrasted with potential property value losses for the Freeman Community of Union Hill presents a stark contrast. The slave cemetery on the former Variety Shade Plantation lacks official protection as a historical site. Yet residents regard it as such and received formal recognition in 2016 by Preservation Virginia, a nonprofit who has specialized in Virginian historical preservation for more than a century. In 2017, Union Hill initiated a process for state recognition by filing paperwork with the Department of Historic Resources.

In rural counties in the path of the ACP and MVP pipelines, there is widespread concern that residents shoulder disproportionate risks because of their rural residency. For example, MVP selected to not add the chemical odorant (Mercaptan) as an emergency alert to nearby citizens if a leak occurs, a common precaution in urban areas. Rural populations may not benefit from the pipeline gas, so the absence of protections similar to those provided to urban residents seems unfair given the lack of benefits to balance the potential harms.

Specific examples below go further to suggest discrimination against rural populations based on low population density. For example, the planned width of the pipeline walls is thinner than what would be used if the pipes were located in urban areas. The number of cut-off values is reduced to cut construction costs, sending a message that rural lives value less.

Federal standards allow emergency responsibility to be placed with the Buckingham First Responders. Since this area is zoned for agricultural and residential use, the compressor required a Special Use Permit. Buckingham County First Responders are inadequately prepared for industrial explosions, leaks, and fires. As proposed, a brief training financed by the ACP with an annual refresher may not adequately assure safety.

Alarming, monitoring of CS-2 will occur remotely from West Virginia with on-site supervision only during week days for the first year. Control of the station with highly pressurized and toxic materials will occur by Wi-Fi tower transmission, in spite of the potential for disruption by storms and other hazards. Less risky fiber-optic cables are more reliable. With these cost-savings measures that do not employ existing technology, it seems inaccurate to define the CS-2 as 'using Best Available Technology' as suggested by the owner and operator during permit applications.

Recommendations:

- 1) We recommend that the Governor encourage state agencies complete comprehensive social, ecological, and comprehensive health impact assessment for CS-2 based on local

demographic context.⁴ We also recommend that testing occur to assure CS-2 noise levels no higher than 55 decibels (daytime) and 40 decibels (night) and explore protocols to limit the number of blowdowns of CS-2 in addition even further (currently ~10 per year) in addition to adding silencers.

- 2) DEQ's comprehensive Air Dispersion Models for the three ACP compressor stations and for emission increases to Pittsylvania Compressor station due to the MVP should include acute emissions in addition to annual averages. Annual averages can mask short term exposures that may be high enough to have an adverse impact on human health. We recommend that emission information be shared with the impacted community in a public forum with opportunities to ask questions.
- 3) We recommend that the Governor encourage state agencies to work with ACP to complete a Quantitative Risk Assessment (QRA) for CS-2 to protect the health and well-being of local populations and to examine emergency response plans for deficiencies.
- 4) We recommend that the Virginia Department of Health train a current staff member or hire an existing expert to build capacity and knowledge within the state about the potential health impacts of gas infrastructure.

TOPIC THREE: MARGINALIZED GROUPS AND CULTURAL RESOURCES

Federal cultural resource assessments for the ACP and the MVP have not adequately incorporated African American and Native American histories. There are important historical sites along the routes of the pipelines that have not received protected or landmark status.

Native American tribes in the state of Virginia are increasingly recognized on state and federal levels. On January 29, 2018, there was long overdue federal recognition of the Chickahominy, Eastern Chickahominy, Upper Mattaponi, Rappahannock, Nansemond, and Monacan Nations. ACP and MVP consultation with tribes was woefully inadequate during FERC permitting, particularly since federal recognition occurred after FERC approval. State agencies have an opportunity to fill this regulatory gap before issuing permits. Tribal leaders at a federal level have communicated a preference to consult with government intermediaries rather than negotiate directly with energy companies.⁵ Tribes may not want to share locations of cultural resources, such as burial grounds and spiritual sites.

The MVP cultural resource plan was incomplete, and the risks are high. In Virginia, the MVP identified 138 pre-historic and historic sites within a mile and 97 within 0.5 mile. There are 8 sites of an unknown time period, suggesting these have not been adequately studied. The 97 sites within a half mile of the project had not been evaluated for their potential to be eligible to the National Registry of Historic Places (NRHP) before MVP made their cultural resource plan in 2015. MVP noted there were "cemeteries, many not mapped, related to Native Americans, enslaved African Americans, and Euroamericans (including possible Civil War-era burials) that may be in the path of the Project."⁶

⁴ For example, Dr. Lakshmi Fjord, an Anthropologist at the University of Virginia, has collected household data in the 2-mile blast radius of CS-2.

⁵ Lovells, H. 2017. The Federal Energy Regulatory Commission Issues Guidelines for Reporting on Cultural Resources Investigations for Natural Gas Projects: A Summary of the Tribal Engagement Provisions <https://www.jdsupra.com/legalnews/the-federal-energy-regulatory-82749/>.

⁶ Mountain Valley Pipeline. 2015. Resource Report 4: Cultural Resources.

The ACP will uncover Native American settlements or artifacts during construction across hundreds of miles on the lands and along rivers of Powhatan, Monacan, Meherrin, Tuscarora, Nottoway, Cheroenhaka, Nansemond, Lumbee and other nations.⁷ ACP's scattershot dispersal technique to share project information covered mostly non-impacted groups in states other than Virginia. ACP received input from a small number of groups, perhaps due to inadequate consultation techniques relying largely on two form letters and a singular multi-tribe information sessional.

The ACP Pipeline and Compressor Station Two (CS-2) are in the immediate vicinity of slave cemeteries, historical school and churches at the Freedman settlement in Union Hill in Buckingham County. The ACP has not undertaken required Section 106, Historic Preservation Act cultural resource reports for the former Slave/Freedmen community of Union Hill. The ACP does not recognize Union Hill's historical importance and current Freedmen descendant population.

The ACP intersects 140 acres of the Great Dismal Swamp (GDS) (National Wildlife Refuge). ACP is a site of ecological diversity and an important historical area. In the early 1600s, Native Americans fleeing the colonial frontier took refuge in what would become GDS. Details about Native American sites in this area remain incomplete. GDS was a survival oasis, a "thriving refuge" for escaped slaves.⁸ In 2003, the Underground Railroad Network to Freedom Program established a refuge to commemorate the importance of the Great Dismal Swamp as an escape route and place of safety for former slaves. There are active archeological sites in portions of the GDS. Thousands of artifacts have been uncovered, but many areas remain without analysis.⁹

Recommendations:

- 1) With hundreds of archeological sites located within a mile of the ACP and the MVP without historical designation, we recommend that the Governor assess the potential impacts of the ACP and MVP on areas of cultural significance to Native Americans and African Americans. to protect and categorize important cultural sites.
- 2) We recommend that the Governor insure that private and public sector entities improve channels of communication with tribal councils while supporting self-determination. In particular, infrastructure projects like the ACP and MVP should consult tribes about impacts to their land and people. Since tribes were awaiting decision on their federal recognition application, they may not have felt free to communicate concerns about proposed pipeline projects. The global standard established to respect indigenous rights is Free, Prior and Informed Consent. These pipeline projects are currently in pre-construction without FPIC, even from federally recognized tribes.

TOPIC FOUR: STATE REVIEW UNDER THE CLEAN WATER ACT

⁷ Native Land. Our home on native land. <https://native-land.ca/>.

⁸ Grant, R. 2016. Deep in the swamps, Archeologists are finding how fugitive slaves kept their freedom. *Smithsonian Magazine*. <https://www.smithsonianmag.com/history/deep-swamps-archaeologists-fugitive-slaves-kept-freedom-180960122/>.

⁹ Hausman, S. 2014. Fleeing to Dismal Swamp, slaves and outcasts found freedom. *National Public Radio*. <https://www.npr.org/2014/12/28/373519521/fleeing-to-dismal-swamp-slaves-and-outcasts-found-freedom>

ACEJ recognizes clean water is part of the public trust. UN Resolution 64/292, passed in 2010, acknowledged that clean drinking water is essential to the realization of all human rights. Several United States acts, including the Clean Water Act and the Safe Drinking Water Act, protect access of American citizens to clean drinking water. Disruption or contamination of water supply is an environmental justice issue because low-income populations can least afford to purchase water or filtration systems and cannot pay higher taxes for improved infrastructure.

To assure water quality, ACEJ recommends that the state of Virginia review federally permitted projects like the ACP and the MVP to certify that they will comply with state water standards. Pipeline construction will involve crossing 1,556 waterbodies and impact large areas of the state. Based on the best available information, the ACP would cross near intakes of water assessment areas of the (1) City of Staunton-Middle River, (2) City of Norfolk-Western Branch Reservoir, (3) City of Norfolk-Lake Prince, and (4) City of Emporia-Meherrin River.¹⁰ The MVP would cross two source water assessment areas: (1) Western Virginia Water Authority-Spring Hollow, and (2) Town of Rocky Mount-Blackwater River.

Individualized analysis of current conditions and expected impacts is important at every crossing, but especially in areas where water quality is already impaired, in areas of seismic activity or geologic instability, and in zones that are sources of drinking water. In rural areas like Bath, Buckingham, and Nelson Counties, where residents rely on wells, streams, rivers, and reservoirs, citizens are worried and alarmed about potential groundwater pollution from pipeline construction and use.

Independent Geographic Information System (GIS) analysis has identified that the proposed pathway is in proximity to stream crossing and water intakes;¹¹ therefore we recommend state agencies conduct environmental justice review of impacts on water bodies to assure risk to water is carefully assessed. The ACP would cross the Blackwater River approximately 4.5 miles from the City of Franklin (Southampton County). Of the 33 HDD water crossings within two miles of Franklin, most lie proximate to neighborhoods with a majority of people of color.¹²

The legal and regulatory record below suggests the potential for significant ecological harm and the need for additional state review:

- MVP: The DEQ has taken enforcement action against MVP since the start of pre-construction.¹³ Federal regulators halted MVP construction in August of 2018 due to

¹⁰ Hansen, et al. 2018. Threats to Water Quality from the Mountain Valley Pipeline and Atlantic Coast Pipeline Water Crossings in Virginia. https://www.nrdc.org/sites/default/files/threats-to-water-quality-from-mountain-valley-pipeline-and-atlantic-coast-pipeline-water-crossings-in-virginia_2018-02-26.pdf.

¹¹ Detailed route maps are available at the [Pipeline Compliance Surveillance Initiative](https://dpmc-gis.maps.arcgis.com/apps/webappviewer/index.html?id=bad99995a7674146903a3aacb83bd879) (CSI). See in particular <https://dpmc-gis.maps.arcgis.com/apps/webappviewer/index.html?id=bad99995a7674146903a3aacb83bd879>; Hansen, et al. 2018. Threats to Water Quality from the Mountain Valley Pipeline and Atlantic Coast Pipeline Water Crossings in Virginia. https://www.nrdc.org/sites/default/files/threats-to-water-quality-from-mountain-valley-pipeline-and-atlantic-coast-pipeline-water-crossings-in-virginia_2018-02-26.pdf.

¹² Ibid.

¹³ DEQ. Regulatory activities related to the Atlantic Coast and Mountain Valley pipelines in Virginia. https://www.deq.virginia.gov/lists/?action=show_list&id=38&page=1; Lopez, T. 2018. DEQ, MVP broke the

repeated incidents of erosion violations.¹⁴ In August of 2018, the Fourth Circuit Courts vacated the Forest Service and Bureau of Land Management permits for the MVP due to evidence of insufficient environmental review before approval.¹⁵

- ACP: Along with dozens of local organizations, the Southern Environmental Law Center submitted a legal case in 2017 requesting rehearing of FERC review given limitations in review prior to approval. While this court decision is still pending, Senator Kaine has repeatedly requested a new FERC review.¹⁶ ACP has since been cited for erosion violation in West Virginia¹⁷ and violations of tree felling in Virginia.¹⁸ ACP pre-construction was halted in May of 2018 to protect endangered species when protections were found insufficient.¹⁹ In August of 2018, the Fourth Circuit Court vacated National Park Service permit for the ACP due to the permit's fundamental contradiction with the NPS mission.²⁰

Recommendations:

- 1) We recommend that Governor communicate with the State Water Board (SWB) and the Department of Environmental Quality (DEQ) about state review power under Section 401 of the Clean Water Act to assure necessary site-specific assessment.
- 2) We recommend that the Governor embrace site-based stream-by-stream assessment to protect Virginia citizen's right to clean water and ensure safeguards are in place for low-income and vulnerable populations.
- 3) We recommend that the Governor delay MVP pipeline pre-construction and construction until the potential impacts can be more thoroughly reviewed with disproportionate impacts taken into consideration. We also recommend that the state exercise state

law, has inadequate erosion controls. WSLs 10 News. <https://www.wsls.com/news/virginia/deq-mvp-broke-the-law-has-inadequate-erosion-controls>.

¹⁴ Hammack, L. 2018. Federal agency order stop on the entire Mountain Valley Pipeline. *The Richmond Times Dispatch*. https://www.richmond.com/news/virginia/updated-federal-agency-orders-work-to-stop-on-the-entire/article_47640162-9399-5ca1-81b5-4d38be2417a4.html.

¹⁵ Weber, M. 2018. US Court vacates US Forest Service and BLM permits for Mountain Valley Pipeline. *S&P Global Platts*. <https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/072718-us-court-vacates-us-forest-service-blm-permits-for-mountain-valley-pipeline>.

¹⁶ Kaine, T. 2018. Kaine calls for FERC rehearing on Mountain Valley and Atlantic Coast Pipelines. <https://www.kaine.senate.gov/press-releases/kaine-calls-for-ferc-rehearing-on-mountain-valley-and-atlantic-coast-pipelines>.

¹⁷ Miskin, K. 2018. WV DEP pipeline developers failed to control erosion, fall the water quality rules. *WV Gazette Mail*. https://www.wvgazettemail.com/news/wvdep-pipeline-developers-failed-to-control-erosion-follow-water-quality/article_70da3076-0ec4-531f-b4bd-7d3f2b2c1fb0.html.

¹⁸ Zullo, R. 2018. Atlantic Coast Pipeline gets violation notice from state over tree felling. *The Richmond Times Dispatch*. https://www.richmond.com/news/virginia/atlantic-coast-pipeline-gets-violation-notice-from-state-over-tree/article_cde8db97-2e9a-58fa-ad09-93a1ff643ed2.html.

¹⁹ Zullo, R. 2018. Federal appeals court nullifies key permit of the Atlantic Coast Pipeline. *The Richmond Times Dispatch*. https://www.richmond.com/news/virginia/federal-appeals-court-nullifies-key-permit-for-atlantic-coast-pipeline/article_c3da09e8-df8d-56d5-a9dd-3499737b1a14.html

²⁰ Lavoie, D. 2018. Appeals Court Tosses Key Permits for Atlantic Coast Pipeline. *The Washington Post*. https://www.washingtonpost.com/national/energy-environment/appeals-court-tosses-key-permits-for-atlantic-coast-pipeline/2018/08/06/63064dfa-99ca-11e8-a8d8-9b4c13286d6b_story.html?noredirect=on&utm_term=.2f28ca0c4875

authority under SB698 and SB699 to delay construction until this review has taken place.²¹

TOPIC FIVE: METHANE GAS, CLIMATE CHANGE, SEA LEVEL RISE

Methane (CH₄), a potent greenhouse gas, leaks into the earth's atmosphere through the production of gas pipelines across the US.²² Gas systems contribute to climate change more than coal and methane emissions are on the rise. A recent NASA study concluded that fossil fuel development is the source of approximately 68% of the recent rise in methane levels in the atmosphere.²³ The potential cumulative impacts of new gas infrastructure are significant.²⁴

Virginians are already experiencing climate change impacts, such as heat waves, seasonal drought, sea level rise, and intensification of storms. Climate disruption often exacerbates inequalities, creates and reinforces environmental injustice, and causes the greatest harm to poor and vulnerable populations.²⁵ Climate justice advocates assert harm from climate change disproportionately affects communities of color, low-income populations, and the elderly and children. Sea level rise and recurrent flooding are contributing to missed school and work in low-lying areas of the eastern shore and coastal zones (i.e., in Norfolk).²⁶ Hampton Road owners have lost homes when they can no longer obtain or afford flood insurance.²⁷ The perception that low income residential areas and communities of color may not receive equal attention when evacuation and storm recovery plans are made, influences the recommendations made below. Due to recurrent flooding, a percentage of the low-income populations from Tidewater Garden and other public housing projects in Norfolk are to be relocated to new housing through a voucher system by 2020.²⁸ In addition to demonstrating inequality in housing access, climate impacts draw attention to Virginia's unequal medical coverage and to existing gaps in health care access. Climate change can result in increases in pollen and earlier rises in pollen contributing to allergies, increase in vector borne diseases from increases in the populations of ticks and mosquitos, higher potential for heat stroke,

²¹ <http://lis.virginia.gov/cgi-bin/legp604.exe?181+sum+SB698>; <http://lis.virginia.gov/cgi-bin/legp604.exe?181+cab+SC10205SB0699+RCSB3>.

²² Brandt, A.F. et al. 2014. Methane Leaks from North American Natural Gas Systems. *Science*. <http://science.sciencemag.org/content/343/6172/733>

²³ NASA (National Aeronautics and Space Administration). 2018. NASA-led study solves methane puzzle. <https://www.nasa.gov/feature/jpl/nasa-led-study-solves-a-methane-puzzle>.

²⁴ Mayfield, D. 2017. Would the Atlantic Coast Pipeline increase the threat of sea level rise in Hampton Roads? *The Virginian Pilot*. https://pilotonline.com/news/local/environment/article_a949fc72-c07b-5d08-a329-463b1eee32f1.html

²⁵ *United Nations News*. 2016. Inequalities Exacerbate Climate Impacts on Poor and Vulnerable Populations. <https://news.un.org/en/story/2016/10/541743-inequalities-exacerbate-climate-impacts-on-poor-vulnerable-populations-new-un>; Leichenko, R. and O'Brien, K. 2008. *Environmental change and globalization: Double exposures*. Oxford University Press.

²⁶ Kusnetz, N. 2018. Norfolk wants to remake itself as sea level rises, but who will be left behind? *Inside Climate News*. <https://insideclimatenews.org/news/15052018/norfolk-virginia-navy-sea-level-rise-flooding-urban-planning-poverty-coastal-resilience>.

²⁷ Jarvis, B. 2017. When rising seas transform risk into certainty. *The New York Times*. <https://www.nytimes.com/2017/04/18/magazine/when-rising-seas-transform-risk-into-certainty.html>.

²⁸ The New Journal and Guide Staff. 2018. Norfolk's urban renewal program gets underway. *The New Journal and Guide*. <http://thenewjournalandguide.com/norfolks-urban-renewal-project-gets-underway/>.

increase in ground level ozone, all of which combine to intensify health conditions such as asthma, other respiratory diseases, and more.²⁹

An important component of environmental justice is mitigating and preventing releases of methane and other greenhouse gases. Reducing methane emissions is especially important for curbing near-term warming. Because methane only lasts for a decade or so in the atmosphere, reducing emissions can have a near-immediate impact on slowing the rate of warming, which is critical for reducing the impacts that we are already seeing, such as sea level rise and worsened extreme weather events.³⁰

Recommendations:

- 1) We recommend that the Governor direct state agencies model greenhouse gas contributions, including methane, of the proposed ACP and MVP comprehensively so the decision-makers and the public have a more accurate understanding of climate impacts.
- 2) We recommend that the Governor ensure that the state includes GHGs in state assessments and should consider rejecting permits for the ACP and the MVP if climate impacts surpasses other energy options. The New York Governor and state resource agencies canceled proposed gas infrastructure using climate justifications, creating a precedent for state level action.³¹
- 3) We recommend that the Governor rigorously work with governmental and independent agencies to revisit initial economic and other calculations related to gas pipelines. Market shifts suggest there may not be a need for additional capacity given the decreasing domestic demand. This will ensure that low income and minority populations are not disproportionately impacted by the proposal and to assess the potential for comprehensive ecological impacts thoroughly.

²⁹ Natural Resources Defense Council. Climate change and health in Virginia. <https://assets.nrdc.org/sites/default/files/climate-change-health-impacts-virginia-ib.pdf>.

³⁰ Ooko, I. 2018. New Science Suggests Methane Packs More Warming Power Than Previously Thought. *Environmental Defense Fund*. <http://blogs.edf.org/energyexchange/2018/02/07/new-science-suggests-methane-packs-more-warming-power-than-previously-thought/>; Howarth, R.W. 2015. Methane emissions and climatic warming risk from hydraulic fracturing and shale gas development: implications for policy. *Energy and Emission Control Technologies*. 3: 45-54.

³¹ Kuznetz, N. 2017. Another pipeline blocked for failure to consider climate emissions. *Inside Climate News*. <https://insideclimatenews.org/news/07092017/new-york-pipeline-permit-rejected-natural-gas-valley-lateral-ferc-climate-change>.

CONCLUSION: OUR PROPOSAL

Virginia's Emergency Task Force on Environmental Justice in Gas Infrastructure

ACEJ recommends an **Emergency Task Force on Environmental Justice in Gas Infrastructure** be convened to assess evidence of disproportionate impacts for people of color and for low-income populations due to gas infrastructure expansion. ACEJ recommends that the Governor direct DEQ to suspend the permitting decision for the air permit for the Buckingham compressor station pending further review of the station's impacts on the health and the quality of life of those living in close proximity. We also recommend that a review of permitting policies and procedures take place and that the governor direct the Air Pollution Control Board, DEQ, and DMME to stay all further permits for ACP and MVP to ensure that predominately poor, indigenous, brown and/or black communities do not bear an unequal burden of environmental pollutants and life-altering disruptions. These actions would ensure that environmental justice has meaningful influence in all current and future energy projects.

Proposed Membership:

- State of Virginia: appropriate agencies (i.e., DEQ, VDH, DSS, DMAS, SHPO, etc.)
- Dominion Energy: Environmental Justice Officer or other representative, company archeologist
- Advisory Council on Environmental Justice (ACEJ) representatives
- Impacted urban and rural populations, including members of Native American nations and Freedman communities
- Civil rights attorneys
- Member of State Control Water Board (selected by SWCB)
- Member of State Air Pollution Control Board (selected by PCB)
- Academia: anthropologists, archeologists, historians, geographers

To: Governor Northam

From: Advisory Council on Environmental Justice

Re: Public Comment and Resolution regarding Union Hill Compressor air permitting process and ACP Pipeline.

Date: September 3, 2018

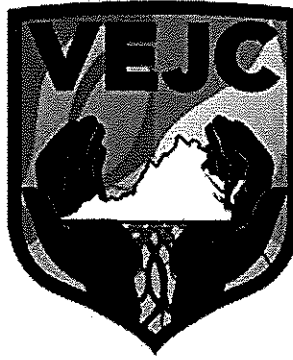
Dear Governor Northam:

At the recent meeting of the Advisory Council on Environmental Justice held in Richmond, VA on August 28th, 2018, a resolution was passed in support of a request made during the public comment period. The Virginia residents asked for the following:

1. Extend the public comment period for the Union Hill Compressor station air permit to 60 days.

In addition, there were concerns expressed which are consistent with comments reflected in our letter to you dated August 16th which highlight the need for a more thorough assessment of risks and potential health impacts associated with the Compressor station and ACP pipelines. We respectfully make this request.

The following quote from our August 16th letter to you describes the underlying issues. "Many of Buckingham's residents, because of their race or color, have been the historical recipients of unequal treatment, for which the above-listed Executive Order was signed to serve as a remedy. Therefore, we encourage that these recommendations (and others that may be directed to the Governor from this Commission in the future) be viewed through this lens so that the state of Virginia can ensure policies, programs and practices will not have unintended consequences that harm citizens who have a history of disenfranchisement".



VIRGINIA ENVIRONMENTAL JUSTICE COLLABORATIVE

220 Hull Street, Richmond, VA 23224

www.vaejc.com

804.370.1143

September 10, 2018

Dear Governor Northam, Senators Warner and Kaine, Virginia State Legislators
cc: Federal Energy Regulatory Commissioners, Dominion Resources, Meryem Karad, Trieste Longwood (DEQ)

We are alarmed civil rights, community-based, environmental, and faith-based organizations who make up the Virginia Environmental Justice Collaborative (VEJC), along with institutional partners, civil rights advocates, consumers, impacted residents, and frontline marginalized communities throughout the Commonwealth. Environmental justice is falling through the cracks because each federal or state agency limits its permitting and regulatory authority to fragmented fields of expertise (air *or* water; air *not* safety or noise pollution).

This approach excludes comprehensive study of the cumulative risks and hazards faced by impacted residents, and supports denial of responsibility for environmental justice implementation. Thus, EJ communities remain targets for new burdens of toxic infrastructure in Virginia. Travesties in two of these communities have prompted this letter and our strong recommendations for immediate actions by you.

The Environmental Protection Agency (EPA) defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. NEPA guidelines detail how to implement environmental justice reviews, including:¹

¹ https://www.epa.gov/sites/production/files/2016-08/documents/nepa_promising_practices_document_2016.pdf

- ❖ Identification and assessment of environmental justice communities using multiple methods, including inclusive local sources to ensure accuracy;
- ❖ Early, meaningful, inclusive, participatory engagement of impacted communities;
- ❖ Identification and protection of African American, Native American, and other cultural and historical resources;
- ❖ Comprehensive analysis of the cumulative impacts of air, soil, and water exposures and their combined risks to human health over time, with particular emphasis on vulnerable populations -- elderly, pediatric, minority, and low-income residents;
- ❖ Assessment of pre-existing medical conditions of fence-line neighborhoods;
- ❖ Equitable access to alternative energy and green infrastructure to reduce toxic burdens.

Virginia Energy Policy (Code of Virginia § 67-101) energy objectives include “[developing energy resources and facilities in a manner that does not impose a disproportionate adverse impact on economically disadvantaged or minority communities.”² In 2017, Governor Terry McAuliffe created the Governor’s Advisory Council on Environmental Justice (ACEJ) under Executive Order #73, to provide “a consistent, action-oriented approach to incorporating environmental justice into decision-making.” Governor Northam’s Executive Order #6 includes: “Engaging the regulated community, local governments, and other interested stakeholders in the development of new protocols”; and, “assessing gaps in DEQ resources or authorities necessary to address challenges identified under this review.”

These commitments by Virginia to resolve the environmental and social injustices identified below demand that energy generation choices give highest priority to the health and safety of the public through equitable access to community-oriented renewable energy.

Buckingham Environmental Justice Review

Union Hill is not suitable for a gas compressor station because of geometric comprehensive and cumulative impacts to air, soil, and 100% of drinking water sources with:

- ACP Intersection with existing 4-pipeline William’s Transcontinental (Transco) at the Union Hill Compressor Station in a large wetlands close to water wells, homes, churches;
- A proposed 54,000+ horsepower compressor station is sited for a majority African American community over 500% more populated than reported by Atlantic Coast Pipeline (ACP) and the Federal Energy Regulatory Commission (FERC),
- ACP’s horizontal directional drilling at a seasonal flooding, seismic faultline site under the James River risks entire watershed drinking water;
- ❖ The African American Freedman community of Union Hill lacks historical preservation of historic black schools, churches, slave burials, and gathering places;

² <https://law.lis.virginia.gov/vacode/title67/chapter1/section67-101/>

- ❖ According to state data and household studies, pre-existing health conditions in proximate households include asthma, chronic bronchitis and other lung disorders, heart disease, diabetes, cancers, and autoimmune conditions;
- ❖ Residents of Union Hill are disproportionately elderly and very young; in all public comment processes impacted residents give strong dissent with specific data for why not to allow a large compressor station in a minority, Freedmen community;
- ❖ Emergency first response infrastructure in Buckingham is inadequate for industrial scale leaks, fires or explosions.³

We request a 30-day extension of the 30-day comment period for the draft air permit for Union Hill Compressor Station because:

- ❖ Community members received access to large documents only weeks before the comment period is set to end; unlike ACP's developer, they did not receive DEQ expert technical support to frame the technological and emissions issues DEQ staff said are the only issues they will read and summarize in public comments;
- ❖ Yet, the lack of organization, lack of tables, and overall impenetrable language in hundreds of pages of the air permit and air modeling require the same level of support Dominion received from DEQ to comprehend;
- ❖ The lack of access to computers and internet by the Union Hill community, coupled with lack of access to rural wifi or broadband infrastructure, compounds inequity.

Chesapeake Environmental Justice Review

Likewise, the Chesapeake and Norfolk lateral pipeline route and process are not appropriate:

- ❖ The siting of a new lateral gas pipeline route in Chesapeake and Norfolk demonstrates targeted impact to majority African American neighborhoods. Many residents purchased homes in these neighborhoods in the late 1960's - early 1970's when other neighborhoods were redlined and they were prohibited from buying elsewhere. Now, those same residents are seniors and unable to move without losing their lifelong investment while others who are able are selling their homes which could still reduce home values;
- ❖ A coalition of Chesapeake subdivisions commissioned a professional environmental study at their own expense. The report determined that should there be an explosion, there are hundreds of homes within potential blast zone.
- ❖ New pipeline is being constructed in a neighborhood that is already in nonattainment for air and water standards⁴ with proximity to superfund sites tied to military installations⁵

³ Based on household surveys, Union Hill has a suburban population density. It is cited incorrectly in project documents as rural.

⁴ https://pilotonline.com/news/government/local/article_33929ed5-ed53-5d7e-8623-35e70d26c6bb.html

and to Chesapeake Energy Center's unlined storage ponds with 3 million tons of coal ash leaching arsenic into groundwater.⁶

- ❖ In order to expedite construction, company officials rushed eminent domain property takings; impacted landowners were improperly informed and offered inadequate compensation;⁷
- ❖ Six public schools - including three elementary schools - lie within the incineration/blast zones of the gas pipelines currently under construction; **the School Board was not aware of the plans until community members voiced their concerns at a recent school board meeting well after construction was already underway. To date, parents of students have still not been notified;** and
- ❖ Community members have not been adequately informed about both its existence and the known risks of gas pipelines and their construction hazards: residents generally thought the new pipes are water lines or infrastructure without risk of explosion.⁸

For these two EJ communities, we recommend Governor Northam immediately create:

An Interagency Task Force with involvement of impacted residents to look at and take actions to reduce or avoid the comprehensive impacts of the lateral and ACP pipelines and the Virginia ACP compressor station, since no existing agency has authority to address cumulative air, water, and land releases and exposures; to divide and oversee completion of these tasks:

1. Undertake: a. Quantitative Risk Assessments (QRA), b. Comprehensive Health Impact Assessments (CHIA), and c. Statements of Impact which taken together address the environmental justice, public health and safety, and cumulative hazards faced by residents of Buckingham (Appendix 1) and Chesapeake;
2. Extend the comment period for the Union Hill Compressor Station air permit to 60 days;
3. Require Dominion Energy to allow Union Hill community representative(s) to enter the Union Hill Compressor Station site to locate unmarked slave burial gravesites and to have gravesites and other archaeological resources surveyed by an independent or public surveyor for the purposes of historic preservation;
4. Undertake and make public baseline analyses of present drinking water, ambient air, transportation and existing health in these communities; and make that data available to the public without incurring delays and costs of FOIA;
5. Immediately notify parents of public school students at schools located in the blast radius of the Chesapeake lateral connection and Union Hill compressor station, and address concerns they raise; and

⁵<https://response.restoration.noaa.gov/about/media/chesapeake-bay-overcoming-unique-challenges-bringing-restoration-polluted-military-sites>

⁶<https://www.wavy.com/news/local-news/chesapeake/appeals-court-hears-chesapeake-coal-ash-storage-case/1066322252>

⁷ https://pilotonline.com/news/local/article_35553a50-cc46-5e36-bfaf-79cd77cf2b9d.html

⁸ PHMSA records annual pipeline incidents, including fatalities and costs.
<https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Portalpages>

6. Require developer-funded bonds for both projects to be held in escrow for Impacted Families to apply for direct assistance who experience any adverse health, mortality, economic, educational impacts or true market relocation costs.

For all infrastructure projects, we recommend :

1. Meaningful participation by impacted populations in permitting and monitoring including effective responses to citizen concerns as per Exec. Order #6;
2. Evaluation of climate and environmental justice impacts in all state policies, programs, and permits;
3. Reduction of state disparity in exposure by which black and brown communities disproportionately experience harm from toxic air, unsafe water, and public safety risks;
4. Development of equitable access to renewable energy sources (Appendix 2)
5. Creation of an interagency Task Force with involvement of impacted residents to look at and take actions to reduce or avoid the comprehensive impacts of the lateral and ACP pipelines and the Virginia ACP compressor station, since no existing agency has authority to address cumulative air, water, and land releases and exposures;

Signatories

Groups

Virginia Environmental Justice Collaborative (by consensus)
Friends of Buckingham
Virginia Interfaith Power & Light
Center for Sustainable Communities
Appalachian Voices
United Parents Against Lead & Other Environmental Hazards
Virginia Organizing
First Alliance Consulting Group LLC.
Sierra Club Virginia Chapter
Buckingham: We The People
Chesapeake Climate Action Network
Water is life. Protect it.
Allegheny-Blue Ridge Alliance
Highlanders for Responsible Development
Interfaith Alliance for Climate Justice
Friends of Nelson
Yogaville Environmental Solutions
Augusta County Alliance
RVA Interfaith Climate Justice League
Mothers Out Front, Hampton Roads

Virginia Pipeline Resisters
Voices from Bath
350 Loudon
RAPTORS VA
Protect Our Water Heritage and Rights (POWHR) Coalition
Preserve Giles
Harrisonburg-Rockingham County NAACP
Sacred Ground Historical Reclamation Project
Virginia Defenders for Freedom, Justice & Equality

Individuals

Swami Dayananda, LOTUS Center for all Faiths, Yogaville, Buckingham
Rev. Dr. Lakshmi Fjord, Friends of Buckingham; Chair: People's Tribunal on Human Rights and Environmental Justice Impacts of ACP and MVP
Queen Zakia Shabazz, Coordinator, Virginia Environmental Justice Collaborative
BeKura W. Shabazz, Founder, First Alliance Consulting LLC
Dr. Mary Finley-Brook, University of Richmond, Richmond
Dr. Irene Leech, Buckingham
Chad Oba, Heidi Dhivya Berthoud, Friends of Buckingham, Buckingham
Alexis Szepesy, Sierra Club Virginia Chapter
Suzanne Keller, retired epidemiologist
Hanuman, Heidi Dhivya Berthoud, Buckingham: We the People
Robert Dilday and Weston Mathews, Co-Directors Interfaith Alliance for Climate Justice
Ben Cunningham, Blue Ridge GeoGraphics, LLC
Kimberly Williams, Norfolk, VA
Steven Baggarly, Norfolk VA
Stacy Lovelace and Jessica Sims, Co-Directors Virginia Pipeline Resisters
Natalie Pien, Unitarian Universalist Church of Loudoun, Green Team Chair
Jonathan Sokolow, Attorney, Reston, VA
Russell Chisholm, Executive Committee Member of POWHR Coalition, Newport, VA

Appendix 4

Critical Unanswered Questions about ACP/Dominion Energy's Union Hill Compressor Station
For four years, we have tried to get state agencies to answer key questions:
here are 106 unanswered questions

PART 1: Technical Questions for the Air Permit and Permitting Process

Emissions

1. How high are the peak hourly emissions for Hazardous Air Pollutants (HAPs) and Volatile Organic Compounds (VOCs) at Buckingham Compressor Station (BCS)? Minor source is based on annual emissions which are an average but peak emissions can really impact health!
2. Emissions during blowdowns occur in large concentrated plumes of methane and co-pollutants. How much of the emissions from the compressor station will remain in the Union Hill and Woods Corner neighborhoods, and how much will travel beyond? With schools are within 10 miles of the compressor station, how will our children be protected?
3. How far away will pollution from BCS extend and in which direction is it most likely to be carried based on wind and other patterns?
4. According to project description on the Virginia Department of Environmental Quality (DEQ) website, the estimated effect on air quality near the facility from the proposed project is that all emissions will comply with all applicable ambient air quality standards. Please share with us the data documenting the current ambient air quality. What is the difference between the ambient air quality now in the air around the proposed project and what is allowable?
5. Sulfur Oxides (SOx) and Hazardous Air Pollutants (HAPs) emissions seem to be higher in the 2018 permit application when compared to 2017 estimates. How can it be best available technology (BACT) if equipment replacement increases these dangerous emissions?
6. Since the recommended distance between compressor stations is usually less than 100 miles, why is the distance between ACP/Dominion Energy compressors so great, particularly since it concentrates dangerous pollution in the Union Hill and Woods Corner neighborhoods?
7. Why does BCS in Virginia have higher emissions than the ACP compressor stations in West Virginia or in North Carolina? Could the spacing of the stations be regularized to not place the greatest risk at Union Hill?
8. Given that industry standard is to have compressor stations at shorter intervals, distributing risks and hazards more evenly over transmission distances. How does ACP/Dominion Energy explain that they have only one compressor station per state, and therefore these are very large and impactful as needed to provide the pressure to cover 200+ miles between stations?
9. Given the fact that ACP/Dominion Energy has not accurately recorded the actual population living next to the BCS site, how will DEQ address the fact that the low population number used (29.4 people per square mile) allows ACP to use up to 75% less heavy pipes and 500% longer shut off valve distances? For air emissions at BCS alone, that means far greater blowdown contents between shut off valves or 15.6 miles apart.
10. Since greater emissions reductions have occurred at other compressor stations, how can the proposed plan for Union Hill be argued to be BACT?
11. Dominion Energy has expanded other compressor stations after permitting and construction. Can we anticipate that this compressor station will be expanded in the future?
12. Unless the company can be prohibited from expanding in the future, why is this facility not considered a major source of pollution now so stronger standards are applied?
13. Known pre-existing diagnoses at Union Hill, include diabetes, asthma and other lung conditions, chronic bronchitis and pneumonia, heart conditions, breast and other cancers, COPD, lupus, kidney disease, epilepsy, multiple sclerosis, brain tumor, migraines and more. Where are the studies to assure that the passage of the Transco pipeline through this portion of Buckingham is not contributing to these medical conditions? Does analysis of BACT take into consideration at-risk populations?
13. Given that particulate matter (PM) causes respiratory damage and there are technologies available to scrub PM from air emissions, how can ACP/Dominion Energy claim BACT if not scrubbing PM?

14. The air permit application and draft air permit do not discuss exact levels of 30+ Hazardous Air Pollutants (HAPS) but do show they will be emitted from BCS. How can we be confident in DEQ protecting our public health if benzene, toluene, etc. and other HAPs known to cause harm to humans are not limited and are tons of HAPs are allowed to be emitted each year?
15. Residents living proximate to compressor stations often report headaches, dizziness, nosebleeds, skin rashes and other concerning symptoms. The DEQ report states that anticipated pollution will not be not harmful to human health because it is within limits, which is also true for other dangerous compressor stations where people are sick. How can you assure us we will not suffer negative health impacts?
16. Could ACP/Dominion Energy increase the amount of gas compressed in the BCS in the future without additional air permitting?
17. While baseline emission data from Roanoke, Hopewell, and other parts of the state might provide the best available baselines for air modeling, how can we be assured of the accuracy of pollution estimates, when the characteristics of these places are clearly different from Buckingham and DEQ is basing the majority of these pollution estimates on unverified-in-real-life modeling outputs and laboratory testing?
18. DEQ air modeling for the BCS is based on many assumptions about temperature, altitude, and other factors that are not accurate for Buckingham. Why was field data not collected? How can you assure test results and thus pollution estimates are accurate?
19. How do you adjust for seasonal variability when assessing impacts of toxic pollutants on human health? For example, how do you take into account the higher exposure level of emissions that occur during the colder months when they stay closer to the ground?
20. The "emergency" gas turbine, which raises the combined horsepower closer to 57,000 is intended for winter months. How is this accounted for in the air permit? Can we be assured that use of "emergency" is not being used to "hide" higher levels of emissions in winter?
21. Please provide an analysis of the long-term effects of the interaction on the human body of all the emissions that will be released constantly and more so during the blowdowns? Many residents are not able to change residences and will be constantly exposed over many years for 24 hours a day every day of our lives.
22. The state measures National Air Ambient Quality Standards (NAAQS) in annual levels, but the blowdown events ACP/Dominion Energy has in their 2018 air permit application release acute emissions over shorter periods. How can nearby residents be assured their health is being protected when state measurements and regulations are not targeted at the specifics of the actual health risk?
23. How many total blowdowns per year, including all compressors, will there be? We never hear the same number twice for the expected number of blowdowns and discussions with other communities with existing compressor stations revealed that blowdowns occur far more frequently than it appears this permit anticipates.
24. What will be the procedure for providing warnings for scheduled blowdowns? Will nearby residents who have health issues be given sufficient time to leave the area until the pollutants are reduced? How long will they have to plan to be away from the area to protect their health? What conditions might affect that time?
25. From the discussion of the BACT analysis in the permit application, it appears that DEQ has relied on the top-down analysis conducted for other (smaller) sites. Shouldn't DEQ have required the applicant to conduct a fresh top-down BACT analysis since BCS is a larger source than the other compressor stations evaluated for BACT?
26. The SOLAR manufacturer for the compressor turbines does not warranty or guaranty emission reductions in real life will approach levels found in modeling tests. SOLAR suggests any estimates must be treated as a range contingent on local variables. Given this careful language and the direct precaution in the SOLAR's sales materials warning against using their estimates in permitting decisions, why has there not been additional independent verification to assure estimates are accurate for Buckingham's local conditions?
27. Since the new technology ACP/Dominion Energy bases their predicted emissions on has never been tested in the field and is taken from manufacturers' laboratory results under

- generic conditions, is it not the best practice to hold the air permit application until the new technology has been tested in similar situations? For example, some of the proposed emissions controls have only been used with small turbines dissimilar to those proposed for BCS, isn't additional testing and use required before we can trust the manufacturer's claims?
28. At least one of the SOLAR turbines has demonstrated successful use of catalytic combustion technology. This technology has the potential community benefit of reducing the risks associated with the ammonia injection. Did the BACT analysis consider the use of catalytic combustion technology?
 29. Why is it considered appropriate to use Occupational Safety and Health Administration (OSHA) work standards to apply to people exposed in homes? Since most people spend more than 8 hours in their homes each day, how can this be considered a relevant metric to assess home exposure?
 30. ACP/Dominion Energy's BACT claim seems to involve selective capturing of methane, so how could DEQ assure these levels are lower to protect our health and reduce threats from climate change? Methane is 86% more damaging to protective ozone than carbon dioxide. How does DEQ plan to require ACP/Dominion Energy to accurately measure as well as to eliminate the release of methane into our community?
 31. In the face of a climate change crisis, how can DEQ permit the BCS to release nearly 80 tons of methane per year?
 32. Is there the possibility of methane leaking from the BCS or surrounding infrastructure that is unaccounted for in the permit application?

Timing and Format of Permitting Process

33. Why do you not provide more time for public comment since impacted communities do not regularly have internet access when large permit documents are stored as web files? Can you not provide summary tables or other education materials to make content more accessible to impacted communities?
34. Will you extend the comment period for another 30 days beyond September 11 so we have additional time to review documents and prepare comments?
35. Why is the public hearing for this permit being held on the last day of the comment period? This prevents anyone who attends and learns more from making a comment. It also prevents citizens who need time to consider new information from responding after they have time to do this.
36. What is timeline for the public comments to be provided to the Air Pollution Control Board (APCB)? When will the APCB public comments be made available?

Monitoring and Compliance

37. Why do impacted community members have to carry the burden of baseline testing? Will the state compensate residents for the time and money we are investing in baseline testing, since DEQ has not done this necessary work?
38. How can we access data/record-keeping on an ongoing basis to ensure the records that are being kept and so that we can be aware of the accurate quantities of emissions we are being exposed to daily, monthly and yearly?
39. How will we know all of the relevant information is being shared with the public in a timely manner? Polluting companies and state agencies have a checkered history in terms of transparency.
40. Does DEQ plan to establish fenceline monitoring systems to notify local residents when air pollution levels from BCS are unsafe?
41. How monitoring and compliance systems involve impacted community members and use local knowledge to make our system more robust? How can we be assured ACP/Dominion Energy will not be allowed to create a sub-par evacuation process or one that does not fit our rural challenges?

PART 2: Questions Not Covered in the Air Permit Application or Draft Permit

Population

42. Why did Federal Energy Regulatory Commission (FERC) and DEQ not use the actual numbers of homes and residents of Union Hill in BCS permitting applications?
43. Now that it is public knowledge that there are hundreds of people and former Slave and Freedmen historical sites requiring state protection, how will you rectify your earlier errors?
44. Why is the BCS compressor station with the highest level of toxic air emissions of the three state-based compressor stations located in the middle of the Freedman community of Union Hill? In draft air permit, it cites Union Hill's "above normal ambient air quality" as the reason. Are people paying a price for being good stewards?
45. Union Hill community highly values its nonindustrial character. It is a quiet, suburban level populated, forested area, with clear night skies and ample wildlife. Descendants of people enslaved here have strong cultural ties to land purchased after freedom. Have former slave and Freedmen cultural practices, such as Black church homecomings and family reunions, been factored into health impact assessments of numbers of people directly impacted by BCS air emissions? Especially when all too frequent blowdowns will occur at the BCS site in this neighborhood?
46. Why are two of three ACP compressor stations in predominately African American neighborhoods and all three are in areas with disproportionately high poverty?
47. Dozens of families in the impact area of BSC have daily connection to lands once part of a familial complex of slave plantations. Local Freedman families have evidence of seven generations of continuous habitation in Union Hill. Since the pipeline infrastructure does not actually cross the land owned by many, they will not receive any compensation for their losses. What is being done to ensure that these families' quality of life and safety will allow them to continue to live in the area for generations to come without loss of health or wealth?

Historical Sites

48. Native Americans historical sites and artifacts will be disturbed with the construction of the Atlantic Coast Pipeline and potentially the Buckingham Compressor Station. Since these lands and histories have never been recognized by Virginia due to inadequate state and federal effort to document Native American claims in this area, how will you ensure that important history is protected?
49. FERC and subsequent DEQ consultation practices violated international norms for Free, Prior, and Informed Consent (FPIC) of Native Americans based on the United Nations Declaration on the Rights of Indigenous Peoples. How will adequate consultation with the descendants occur?
50. The only archaeological excavation of Native American sites in Buckingham took place at the James River at Wingina. However, University of Virginia archaeologists noted the large distribution of sites they could not undertake, as well as the hundreds of years of artifacts recorded by amateur collectors. The Advisory Council on Historic Preservation (ACHP) in a letter to FERC called for far more pre-colonial and antebellum archaeological study of Buckingham's sites at the James River and Union Hill before ACP construction. Can you explain how state agencies are confident in the historical records presented by ACP/Dominion Energy when there have never been adequate state ethnographic, anthropological or archeological studies in this area? How will we avoid the near total erasure of both pre-colonial and antebellum histories in a key site of Virginia and U.S. history?
51. To ensure that history is preserved, how will the exact number, location and historical period of each of the dozens of burial grounds and cemeteries in 1.2 mile radius of the compressor station be recorded?
52. A Buckingham County slave burial map was first created in the 1930s under the Works Progress Administration, and Buckingham Historical Society members noted that at least 50 more than the hundreds surveyed are yet to be surveyed. This includes a more than 100+ unmarked slave burial ground on the former Variety Shade Plantation land. We know by red dots on this map that in the 68-acres purchased by ACP/Dominion Energy for the BCS site,

there are numerous slave burial sites. Why have state agencies not required that 68 acres to have a cultural resource report filed?

53. How will the historically segregated African American schools in this part of Buckingham be recognized and protected? Why these have not received state recognition like those in other parts of the Commonwealth?

Liability and compensation for damages

54. Farmers have reported a current gas leak in the existing Transco 4-pipeline corridor in Union Hill. Has Transco reported that leak to state agencies? How often have such leaks on the Transco occurred?
55. Local residents are concerned that Transco paid no liability or damages fines directly to families whose homes were destroyed or damaged by the explosion in Appomattox County next to Buckingham County. What protection will be provided to us if the compressor station causes damage?
56. Buckingham County is a low medical-resource county. There is a clinic with a part-time doctor. Residents have to travel to Charlottesville or to Farmville -- long distances -- by ambulance in emergencies. Everyday healthcare requires driving long distances, at high costs, for this underserved, high poverty populations already. ACP/Dominion Energy denied a request by the Buckingham Planning Commission to set aside a bond to pay for the costs of health impacts from BCS. If the compressor station makes us sick or sicker, how will the state ensure we get the health services we need?
57. Mental health services are inadequate in our rural area. Now, given the additional stress and pressure already expressed by nearby residents about the threat to the health, quality of life, value of their land for themselves and future generations posed by compressor stations, how will we obtain enough social workers and psychologists to provide mental health services to this most vulnerable population? How will the state support those cannot afford these services already and if built, these additional social and monetary costs of ACP/Dominion Energy's new infrastructure constructions and operations here?
58. If community members get sick as a result of toxic emissions from the compressor station like formaldehyde, benzene, and hexane, would they be forced to sign non-disclosure agreements before receiving help with medical bills from ACP/Dominion Energy or Williams Transcontinental (Transco)?
59. We have been told that our home insurance premiums will not increase because we live in the blast zone of the compressor station. We have ample evidence from other communities already proximal to pipelines and compressor stations that homeowners' insurances companies are dropping customers at these sites? What recourse will we have if they do increase or if our insurance carriers drop our coverage?

Risk Assessments

60. Since Quantified Risk Assessment (QRA) is the best available management practice in instances of social vulnerability and risk of exposure, given the high of economic and political marginalization in Buckingham, isn't a QSA called for?
61. If a Comprehensive Health Impact Assessment (CHIA) has not been conducted, how did DEQ assess existing health conditions and numbers of persons in close proximity together with air modeling at BCS?
62. If state agencies have not looked at risks comprehensively, how can DEQ and other agencies assure Buckingham residents that the benefits outweigh the risks? Why not use known medical science to prevent known public health impacts of large compressor stations before issuing ACP/Dominion Energy's BCS air permit for public comment?
63. Why is the intersection of the existing 4-pipeline Transco corridor at BCS not placed at the forefront of the risks and hazards uniquely faced by the people of Union Hill? Given the then quantitative higher risks and hazards of leaks at this site alone?

Energy Poverty

64. The ACP and the BCS, if built, would not create energy access in Union Hill or Buckingham generally. Instead, BCS would contribute air and water pollution raising health costs paid by local residents. How will the state address this inequity?
65. On the basis of poverty alone, what does the state plan to do to address the fact that many in Union Hill and Buckingham live in energy poverty, defined as unable to cover basic utility provision? Union Hill's population is predominantly elderly and the very young, the most vulnerable to high heat and cold conditions. A door-to-door household study around BCS showed residents have pre-existing health conditions but 55% of the population responding could not afford air conditioning. How will the state consider the inequity of highest environmental impact costs per capita of the ACP on a National Environmental Policy Act (NEPA), majority black, impoverished community?

State Water Control Board

66. Will the State Water Control Board consider impacts to the wetland on the site of the BCS? If not, who is responsible?

Economics

67. We did not choose to live in an industrial area and our community is not zoned for such use. However, the Special Use Permit allows this industrial equipment to be placed in our community. How will our property values be protected? How can we be assured that this is not the start of a permanent change in use?
68. Has state agencies considered the dropping values of property in this community? The latest sales involved far lower market values than before ACP's plans for BCS.
69. Economists document that existing pipelines can provide more capacity and will transport gas three to eight times cheaper than can the Atlantic Coast Pipeline. Why are we not using the most cost effective means?
70. The presence of the compressor station in our community will affect current clean and sustainable economic uses of our property. Construction of BCS and daily operations will impact raising cattle and other domestic animals, growing crops, our kitchen gardens, a yoga teaching and retreat center of Yogaville, with a large resident and over 10,000 annual visitors seeking peace and spirituality. Future plans already foreclosed in this neighborhood include a greenhouse business and a small winery. We ask DEQ to consider and weigh in the balance ACP/Dominion Energy's desire for profits for shareholders' benefits not Virginia utility consumers. Do our investments in good quality of life and future economic prosperity have to be sacrificed?
71. How is the state ensuring that our community is not economically damaged by this infrastructure and that it will be economically sustainable in the future?
72. When renewable and alternative energy is sited on property, landowners get monthly lease payments. Instead, properties crossed by pipeline receive a one-time easement payment. How much income could landowners receive if this land was used for solar infrastructure?

Renewable and Alternative Energy

73. How many solar jobs and how much energy could be produced if the money invested in the BSC was invested in solar infrastructure instead?
74. We ask DEQ to support the Union Hill solar projects. What can DEQ do to ensure inequity in energy burdens (i.e., toxic exposure) changes to equity in access to income producing renewable energy?

Baseline Testing

75. We saw that in December of 2016, the Office of Environmental Health & Safety (OEHS) made a clear recommendation to DEQ to do baseline testing of well water and septic fields along the length of the ACP. Why was that not done?
76. Does DEQ know that 100% of drinking water, all water, is from individual wells in almost every part of Buckingham, including Union Hill? Has DEQ assessed the distance of these

wells to underground aquifers where the ACP plans to intersect with the existing 4-pipeline Transco underground in a large wetlands?

77. We also saw that in October of 2017 that VA Department of Health (VDH) recommended to the DEQ to do surveys for both the ACP in karst topography of wells and surface water. Why was that recommendation not accepted and followed through? Geologic reports for the James River where ACP/Dominion Energy plans to horizontal drill underneath the river find "karstic rock features" and a seismic faultline. As this site is very close to the ACP's BCS site and the James River is a major river basin and primary water source, what has DEQ done to assess the hazards and risks of these two interlinking major ACP infrastructure sites?
78. Will DEQ conduct baseline testing of well water, surface water, air, and noise? If so, when? Shouldn't it be done in every season of a year to be most accurate?

Local Emergency Response Capacity

79. Has the facility prepared a Spill Prevention Contingency and Countermeasure plan for the tanks and have they shared the SPCCs with the local emergency planning agencies?
80. What plans have been made for local emergency responses?
81. When will we see evacuation plans?
82. We are worried about the inadequacy of local emergency response services in Buckingham and the highly pressurized, toxic, explosive, and flammable nature of the materials at BCS and in other ACP infrastructure. How will the state assure the safety of local residents?
83. How will ACP/Dominion Energy use local knowledge of limitations in emergency response to make our system more robust? How can we be assured they will not be allowed to set a standardized evacuation process that does not fit our local challenges and characteristics?
84. Many compressor stations start without clear evaluations plans. We know people currently living with compressor stations that have no local emergency plans. FERC does not enforce their provision. What steps can we take if ACP/Dominion Energy's promised evacuation plans are inadequate to assure public safety?

Necessity

85. Are you convinced of the necessity of the ACP when there are existing pipelines that could carry this gas and they were not adequately explored, according to FERC Commissioner Cheryl La Fleur?

Noise

86. We have seen documentation of compressor stations of the same size and same general equipment as BCS generating 90 decibels of noise during blowdowns. How can you assure BCS noise levels will stay below the 55 decibels permitted?
87. Dominion representatives repeatedly tell the press residents will not even notice the noise of the compressor. On what evidence is this based?
88. Please provide us with studies documenting the long term health effects of long-term exposure to permitted noise levels of 55 decibels.

Property Rights and Eminent Domain

89. People in our community have eminent domain court proceedings scheduled for 2019. Can they be assured they will have fair access to all levels of the courts before ACP and BCS construction?

Waste

90. Gas from Marcellus shale has been recorded to contain higher than average amounts of radioactive materials. These radioactive materials and other pollutants end up in the waste from pigging operations done on site at Buckingham. What is the protocol for measuring, storing, and disposing of the toxic waste from the approximately 10 pigging operations per year in the BCS permit?

91. We have been told the BCS construction and ACP construction will require significant water and that the produced water or wastewater containing pollution will be trucked out of Buckingham. Where is the water coming from?
92. Where will waste water from construction activities be taken and dumped?
93. How many water trucks will Buckingham residents need to anticipate on our roads during construction?
94. What are the plans to monitor and control particulate matter pollution from truck construction traffic and other construction activities?

Recordkeeping and Transparency

95. Why are we the last to find out what will happen in our neighborhood? Why do we have to rely on Freedom of Information Act requests to get the real story?

Staffing/Security

96. Given that wi-fi transmission is unreliable in Buckingham, how can Dominion claim use of BACT? Fibre optic cables are the proven best current technology. What can be done to increase security of remote control of BCS from West Virginia?
97. We have received conflicting information about 24/7 staffing of BSC for onsite real-time data collection & monitoring during the life of the compressor station. Will there always be staff on site, even on weekends, holidays, and after the first year?
98. Can the APCB approve the permit when there does not appear to be a Special Use Permit (SUP) for the stacks?
99. How is it possible for DEQ to go forward with compressor station permit hearings with the uncertainty that exists regarding FERC's certificate?

Transco Pipeline

100. Many gas industry reports, and even FERC Commissioner LaFleur, argue the ACP is unnecessary and redundant. If the ACP is canceled due to market shifts or regulatory shortfalls, would the BCS still be built to move the increased gas that is expected with the expansion of the Transco pipeline?
101. Can increases in Transco gas compression in Buckingham move through the compressor without being regulated in an air permit?
102. Would impacted residents be consulted prior to future decisions about increases in gas transportation through the BCS or can DEQ approve increases without community knowledge or input?

Ammonia Tanks

103. The size of the ammonia tanks on the BSC site have increased from 8,000 gallons to more than 13,000 gallons. How does DEQ assure the safe handling of this dangerous material?
104. What relation has this ammonia storage to the Control Board hearings on ammonia set for September 11 & 13?

Electromagnetic Radiation

105. Microwave communication towers impact health due to electromagnetic radiation (EMR). What documentation can you provide us on the effects of exposure on nearby residents from microwave towers like that proposed at BCS?

Uncertainty and Foreboding Fear

106. Every time Buckingham Board of Supervisors has a meeting, do you know we wonder what new pipeline-related surprise we will face? Every low flying helicopter and construction crew invading our quiet neighborhood creates a sense of dread and fear that means our quality of life has already diminished.



Air Division 1, rr <airdivision1@deq.virginia.gov>

Public Comment: ACP Buckingham Compressor Station Air permit: Dr. Lakshmi Fjord

1 message

Lakshmi Fjord <lakshmi.fjord@gmail.com>

Fri, Sep 21, 2018 at 11:59 PM

To: airdivision1@deq.virginia.gov, citizenboards@deq.virginia.gov

Please find attached my public comment for the Atlantic Coast Pipeline Buckingham Compressor Station air permit to the VDEQ Air Division

I would respectfully ask that you make the full document of my comment available to all members of the Virginia Air Pollution Control Board. And, I have included this citizenboards email address on the email recipients.

Sincerely,

Lakshmi Fjord
420 Altamont St.
Charlottesville, VA 22902
510-684-1403
lakshmi.fjord@gmail.com



LFjord ACP Air Permit Comment.docx

742K

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Sept. 21, 2018

Public Comment: Air permit, minor source construction permit, Atlantic Coast Pipeline LLC, 21599

I respectfully address my public comments to the Air Pollution Control Board members because this citizen board has been charged with the power to approve or not approve the air permit submitted by Atlantic Coast Pipeline-ACP for their Virginia compressor station (CS 2) sited for Union Hill, Buckingham, Virginia.

I ask the comment readers of the DEQ Air and Renewable Energy Division to kindly read and summarize those parts of these comments that apply to the narrower limits of their authority to respond to expert and impacted citizen's technical comments, permit omissions, and questions to be answered for which the answers are not available in those permit documents. In these comments, I wear both expert and impacted citizen hats, the details of which are found in my affiliations listed with my address information above.

Power of the VA Air Pollution Control Board

The DEQ Air Division staff met yesterday (9-20-18) with a group of legal, social scientist, community group, and non-profit representatives, including myself, to discuss what the Air Division "can and cannot do" vis a vis the Buckingham compressor station (CS 2 – according to Atlantic and FERC) air permit application -- among more general permitting work by staff. And, what the Air Pollution Control Board can consider and do to deny or approve the air permit.

Mr. Dowd explained that in Virginia, it is in the authority of Virginia's Air Pollution Control Board's to give final denial or approval of this air permit. That you may consider more comprehensive and more site specific concerns with the Buckingham air permit is confirmed by the language of the APCB 2010 statute: "The Board in making regulations and in approving variances, control programs, or permits, and the courts in granting injunctive relief under the provisions of this chapter, shall consider facts and circumstances relevant to the reasonableness of the activity involved and the regulations proposed to control it, including:

1. The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused;
2. The social and economic value of the activity involved;
3. The suitability of the activity to the area in which it is located; and

4. The scientific and economic practicality of reducing or eliminating the discharge resulting from such activity.

My comments are framed in reference to each of the four numbered points of your statute, particularly at their intersection with “site suitability” and “incorporating environmental justice into decision-making” as per Virginia codes and Executive Orders.

Virginia Energy Policy (Code of Virginia § 67-101) energy objectives include “developing energy resources and facilities in a manner that does not impose a disproportionate adverse impact on economically disadvantaged or minority communities.” In 2017, Governor McAuliffe created the Governor’s Advisory Council on Environmental Justice (ACEJ) under Executive Order #73, to provide “a consistent, action-oriented approach to incorporating environmental justice into decision-making.” Governor Northam’s Executive Order #6 includes: “Engaging the regulated community, local governments, and other interested stakeholders in the development of new protocols”; and, “assessing gaps in DEQ resources or authorities necessary to address challenges identified under this review.”

As a citizen board, I’d like to give you some sense of who we are – people who woke up one day to discover their known world would now be turned upside down by people who want to take for their advantage what you have, with no benefit whatsoever to yourself, your family, your land, or your community. First, we have had to become “citizen scientists” over the past four years since we first learned about ACP siting their only Virginia compressor station in Union Hill, Buckingham County, VA. For four years we have had to educate ourselves, our neighbors, and our communities about fracked gas infrastructure -- because no local, state, or federal agency tasks themselves with informing, educating and giving expert knowledge to impacted communities – only to developers. We performed household demographic studies, including existing health conditions, land uses, and local family history. We read thousands of pages of field studies of health impacts, construction and traffic, man-camps’ crime, grave impacts to water, air, soil; we had to study hydrogeology and former plantation and Freedmen history; I have made 17+ public comments: to local Buckingham Planning Commission and Board of Supervisors, FERC, VA DEQ Water Division, VA DEQ Air Division on site [in]suitability, missing cultural history, erased demography, current green economic uses of our land, and water, air, and soil impacts of this siting in an A1 Agricultural Zone.

We who did not “go along” with ACP’s Union Hill compressor station site plan have faced a lot of hostility from our elected local Board of Supervisors, whom Dominion had been priming for 3-4 years prior to 2014, with promises of increased corporate taxes (still without any accounting formula given for their figures) and jobs. Jobs have long been limited in Buckingham and related to extraction economy: clear-cut forestry, kyanite mine, slate quarry, two prisons, once gold and copper mining. Buckingham was once a rich county based on prosperous slave plantations whose size and profitability are revealed in the ledgers left behind by owners listing hundreds of slaves and their individual values on lists of “Stock”; alongside investment of their profits in real estate in New Orleans, New York City, Florida and Texas. Buckingham has never fully recovered from the loss of the 2:1 majority slave labor since forced emancipation after the nearby surrender at Appomattox.

We who “oppose the pipeline” and the Union Hill compressor station have been branded as “environmental zealots.” But, that is precisely who we are not. We are listeners to promises and observers who on the day that FERC approved tree cutting for the ACP at 5p at night witnessed

within 15 minutes, 15 trucks all with out of state licenses from very far away (Utah, Wyoming, Arizona, closest was West Virginia) piled up at one of Yogaville's community member's access road to survey and cut trees. Where they did not even yet have an easement agreement. In a county that has relied on tree cutting jobs and income from one's timber for hundreds of years -- not one Buckingham tree-cutter had been hired by ACP contractors, despite more than two years to plan that night's work. Not one Buckingham tree-cutter was hired during that entire easement tree-cutting window before the Migratory Bird season began.

We impacted people of Buckingham are people for whom there are no easy generalizations. We are children of immigrants, descendants of white colonists, impacted descendants of former slaves who, after Appomattox, bought from or were given land from their former white owners, cattle, dairy, and organic farmers, yogis who moved to Buckingham for the pure natural resources, retirees who invested their life savings in affordable land and new homes, and people who planned sustainable agricultural business projects to build greenhouse businesses and vineyards. We have come to know each other better across fissures that are still deep in Buckingham: across race, across religion, across educational and geographic background.

All are directly impacted people whose hopes, investments, and potential to provide sustainable green energy jobs in and near Union Hill are now at a standstill -- thwarted by ACP LLC, a for-profit, fracking and fracked gas transmission pipeline enterprise allowed to seize land for easements by eminent domain. The citizens responding to this call for public comment are not politically aligned on one side of the aisle nor are Dominion Resources' campaign contributions to local, state, and national elected officials, or charitable contributions to local groups where they seek permits based on political parties.

Now that the "Baptists and the Yogis" have made national news, now that Union Hill is becoming the symbol for larger environmental groups about all that is wrong with taxpayer-funded support by state agencies and elected officials to for corporate profit-only fossil fuel developers seeking to build no longer needed, toxic polluting, far more expensive than renewable, infrastructure -- Dominion is trying to "reach out" to Union Hill, making allusions to "what they can do for" the community. When Union Hill's story was local and suppressed even by people in other counties focusing on moving the pipeline from this site or that site, Dominion completely erased Union Hill's existence from its applications and records. When our household study and historic cultural research finally reached the national stage, now Dominion reps are meeting with Union Hill community residents -- but with no talk of compensation which is what they want. Each week, at meetings Dominion reps are asked for and promise **an evacuation plan**. Yet, even that minor gesture of goodwill has still not been delivered by Dominion -- after 4 years.

We call it "running down the clock" during the DEQ and APCB air permit process. So, when Chairman Dunn of the VA Water Control Board asked the rhetorical question of the Richmond Times Dispatch yesterday after their vote, whether or not "a water permit can stop the ACP???", keep in mind that Dominion thinks you of the APCB can, through rejecting their air permit for Union Hill compressor station. Without the Buckingham compressor station, there is no transmission to Cove Point overseas markets through the Transco -- key to their business plan now that they have taken their promised gas-fired power plants off the table as too expensive to build.

Thus, we ask members of the APCB to not recuse yourselves unless you are directly indebted to

Dominion Resources for your or a family member's employment. For, everyone in the state of Virginia is enmeshed in webs of economic ties to Dominion Resources, whether legal consultants or non-profits that have received funds from fines levied on Dominion, or me as a Dominion Energy utility customer in Charlottesville. However, in Buckingham County, where Yogaville is located, we are not indebted to Dominion for providing and maintaining our public utility infrastructure. We have an electric co-op because Buckingham is too large and rural to be profitable to Dominion Energy.

Yet, Buckingham County is being asked to bear the largest toxic burdens of any county in Virginia by a non-public utility provider, ACP LLC. Which through legislative influence, by sharing a parent company, allows Dominion Energy, my public utility, to force me to pay the full costs of the ACP construction and operation. Forces me to pay to forever change the clean air, water, and soil of Yogaville, whose site I helped to choose in 1979 to re-locate our spiritual community because of its existing pure natural resources that are integral to our spiritual practices (pranayama, hatha, meditation), our spring-fed organic farm, our 100% drinking water sources from individual well water as throughout Buckingham, and where ACP plans to drill under the designated Scenic and Historic James River on Yogaville community member land, and from there route their pipeline within 700 ft. of our school.

This is the personal angst I face, especially when I consider how ACP's site planning for the Buckingham compressor station threatens Union Hill, a community I hold dear. I have worked as a full-time volunteer community field researcher for 3 ½ years, putting my yoga principles of non-violence together with my PhD anthropology training and experience from over 22 years in NIH- and Fulbright-funded community medical field studies to conduct NEPA-esque demographic and cultural historic research in Union Hill to remedy Dominion's erasures of factual site characteristics for CS 2.

In our meeting with the DEQ yesterday, it became clear that the DEQ wants to "move on" from the air permit to "lessons learned" from Buckingham permit process. Certainly understandable, given that they do not believe they have any authority to consider the environmental injustices, the environmental racism, of ACP's site choice for their CS 2. ACP's denial of racism in their site choice, repeated often now, is belied by their actions to entirely erase the name of the community and factual population of Union Hill, the 99 households in close proximity on all sides, its majority African American race, and its historic Former Slave and Freedmen history in all public documents, including applications, cultural resource reports, and even to my face by the CEO at this year's Dominion stockholders meeting. When asked if he knew about the household study I had conducted in Union Hill, its race, and population statistics, its history, Mr. Farrell responded, "Yes." Would he correct those factual errors? "No," he would not. Below, I will provide that historical and household evidence.

Were there other places to intersect their new ACP Pipeline ("redundant" according to FERC Commissioners LaFleur and Glick) underground with the existing 4-pipeline Transco corridor? To send fracked gas from their drilling sites in West Virginia to their Cove Point LNG facility in Maryland for foreign markets (proudly reported to shareholders by CEO Farrell with photos of Japanese freighters shipping Dominion's fracked gas overseas)? Yes, of course, many sites in this sparsely population rural county: many sites far less populous than Union Hill, and not majority African American.

The added burdens from this new race divide created by Dominion's site for CS 2 need to be

considered a true social cost to Buckingham, with moral implications for our state and our nation. The legacy of slavery in Virginia is a living reality in Buckingham. And, it manifests in the complete capitulation by the Buckingham Board of Supervisors (BoS) to Dominion's insistence at the CS 2 special use permit hearing that there would be no "bond held in escrow" for direct impact costs to Union Hill residents; no money given for extra safety equipment or emergency responders in an all-volunteer fire department; no willingness to even listen to Union Hill requests to somehow link into the 125 ft wifi tower in an "internet desert," among just a few of the list for this CS 2 site proposed to the Planning Commission based on community input. The BoS unanimously approved the CS 2 site without these conditions, with a recusal by 37-year employee of Dominion who stepped down as Board chair for this vote and went back on after it. The only "condition" was for one on-site shift for one employee, where ACP had planned to remotely monitor this complex from West Virginia solely through wifi transmission. Note: the absence of jobs related to operations activity?

The intractability of Dominion toward the Union Hill community, not budging an inch to provide any tangible cost benefits to the community or protections, the race divide made worse by Dominion, is amplified in my power-point slide below. It is a tale of two Dominion energy projects in Buckingham, which is a tale of two races.

Dominion in Buckingham: A tale of 2 energy projects is a tale of 2 races
Dominion & solar vs Dominion & fracked gas transmission

For white heritage farm = solar fields & monthly lease payments for domestic renewable energy; used to attract Amazon hub to Richmond for sustainable jobs of the future.

For Union Hill, African American majority, at ACP & Transco, redundant, outdated, costly toxic emitting complex to send fracked gas overseas. One-time easement payment seized by eminent domain; no payments to all households that ACP does not cross with pipeline.

Reuters, May 24, 2018: "Vista Energy and Dominion Energy – which serve about 5.5 million electricity customers in more than a dozen U.S. states – both say they are done building combined-cycle natural gas-fired power plants. Instead, they are building large solar plants, which offer plentiful and inexpensive electricity."

In Virginia, Dominion Energy ended several maintenance contracts it had with GE this year when it mothballed a large gas-fired plant and idled seven other coal and natural gas units in the state. Dominion aims to build 4,720 megawatts of solar by 2033, the equivalent of about five large combined-cycle power plants. It is opening a new combined-cycle natural-gas plant in Virginia this year, built with GE and Mitsubishi equipment. It said it has no current plans to build more such plants. "Solar is very cheap," Dominion spokesman Dan Genest said. "These units were just not cutting it."

Yogaville has already made strides towards solar energy production. And, Friends of Buckingham has been working on a project called, "Solarize Buckingham" to create equitable access to solar energy production. Union Hill large landowners would greatly prefer monthly

solar lease payments instead of no payments and no compensation by Dominion at their CS 2 site – yet, heaviest load of toxic burdens of the ACP. We in Buckingham want vocational training at Buckingham high school for sustainable green energy jobs in renewable energy and energy conservation. Not false promises of even lowest paying tree-cutting jobs that ACP didn't think they needed to deliver on for impoverished Buckingham.

The race-based characteristics of the CS 2 site in Union Hill and Buckingham County generally are now rare in Virginia. Where large proportions of the population are descendants of former slaves still living near descendants of former white plantation owners that enslaved their ancestors. African American residents of Union Hill who speak out about the environmental injustice of the CS 2 site in local permit hearings or any public hearings, disrupt a fragile fabric of race relations hundreds of years old. Survival has relied on silence, and so, they constantly face shunning and reprisals. It was the white descendants of former Variety Shade plantation owners who sold 68 acres to Dominion for the CS 2 complex, receiving \$37,675 an acre for land where then market value was \$3,000. Now, black heritage land values that lie close on all sides of that site are deeply slashed in value.

With this context in mind, forgive us for resisting a narrative we heard yesterday expressed by DEQ staffers, that Union Hill will now stand for “lessons learned” about what not to do in order to prevent future disproportionate environmental injustices based on targeting communities of color for new infrastructure sources of toxic pollution. Rather than to protect Union Hill today. Such narrative slippages reveal that DEQ has “approved” this air permit they send to you, without reading other experts’ comments, in advance of your decision. Those sorts of sacrifices of their lives, labor, and respect have been asked of Union Hill’s Freedmen descendants for far too long. Please do not allow it.

Cost/benefit analyses related to activities included in the CS 2 air permit

I include these comprehensive social, historical, and environmental justice injuries and their economic and social costs onto the comparative balance sheet equation of cost benefits from the activity vs. cost benefits of not allowing the activity, thus preventing the “injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused.” For, I hope the Board agrees that it is necessary to weigh in the balance a fracked gas transmission line already threatened by redundancy and over-building. Energy conservation has led to sharp downturns in electric consumption. Shale gas reserves from West Virginia have always been assessed at a 7-10 year extended lifespan. We are already more than halfway there since ACP’s initiation. Transco operates at just over 55% capacity and has already made public comments to FERC about their being “no need for the ACP, which follows other industry and economic expertise. Ironically and horribly, Union Hill will be subject to far higher toxic pollution if the pipeline carries less than 50% capacity. And, nowhere I believe does the DEQ address Transco’s additional pipelines in this mix of comprehensive injuries to safety, health, and climate change and more of this intersection of 5 pipelines at CS 2 site.

Has DEQ included Transco’s 4-pipelines’ emissions in their figures? Considered their increased chance of leaks and breaks? Where Dominion’s “activity” involves threats posed by a large fracked gas compressor station’s necessary operations to pressurize gas to the highest allowed psis of pressure to transmit gas over 200 miles to the next compressor station CS 3 in Northampton or along the Transco pipelines to Cove’s Point LNG facility and offshore markets. Partnership for Policy Integrity (PFPI) has just released a report on “secret chemicals” used in fracking operations that are present in transmission lines, emitted in compressor station

blowdowns planned or accidental. These chemicals are used in drilling and fracturing but well operator don't identify them for proprietary reasons. While this report focuses on the possibility of fracking and wastewater dumping in the Delaware River Basin – a water source for New York City and Philadelphia – its discussion of secret chemicals has broad relevance to the air permit. DEQ doesn't even know all the toxic chemicals to look for, to create modeling for, in CS 2's air permit.¹ The toxic cocktail of known and unknown toxic sources of emissions threatens injuries to our air quality, to 100% of our drinking water supply in Buckingham, increases the individual medical expenses of those impacted by any level at all of new toxic pollutants, particulate matter from finest grain to largest, any amount of benzene, N02, and the rest of the toxic brew listed in the air permit and missing from the air permit as noted in expert comments below.

DEQ staff will tell you as they told us in their Buckingham Informational Meeting on Aug. 16, 2018, and yesterday, that they have spent hundreds if not thousands of DEQ expert staff taxpayer funded time to research Best Available Control Technology –BACT so that no matter the size of the population, their race and age vulnerabilities and known health disparities – this air permit will never ever create any health impacts. We are not sanguine about that statement. It does not match the facts about the cumulative impacts of this cocktail of chemicals used in the fracturing process, the VOCs, particulate matter, HAPs, and radon released, taken together and continuously ingested by humans, animals, plants; released into the air, settled into our water supplies, and percolating into our soil – and their cumulative impacts on individual health of each species exposed.

DEQ Air Division staff informed us their suggestions for BACT and their modeling are based on an EPA-generated list of field studies on compressor stations that is updated only every five years. In fracked gas studies 5 years is a veritable lifetime since fracking and its infrastructure development has exploded in volume in that time span. None of the 17 studies DEQ used as data involve compressor stations of the size proposed for CS 2, we are told, and therefore, it was necessary to spend hundreds of hours on modeling by DEQ staff. I asked if they had read the annotated bibliography compiled, published, and made accessible for free by Physicians for Social Responsibility and NY Concerned Health Professionals each year for the last five years. This year's -- 2018's Fifth Edition -- comprises 1300 independent scientific studies on fracking and its infrastructure and health impacts, of which most studies are very recent (2016, 2017), not outdated as those used by EPA list.² “No,” I was told. They use the EPA list only.

DEQ reported to us, people impacted by the CS 2 site, the hundreds of hours of modeling they conducted for the ACP CS 2 and to analyze the data. None of this time was or will be paid for by Dominion, but by us, Virginia taxpayers. They are proud of that expert time, care, and attention spent because they believe they cannot deny a permit, only try to make it better.

Yesterday, we learned of the 4 times DEQ Air Division staff “rejected” Dominion's CS 2 air permit for Union Hill, telling Dominion staff to improve it, and how exactly to do so, with greatest detail. We on the ground will tell you that our local Board of Supervisors, we impacted people, our experts, have not profited from those thousands of hours of taxpayer funded expert

¹ <http://www.pfpi.net/secret-fracking-chemicals-threaten-delaware-river-basin-pennsylvania>

² Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking, 5th Edition, 2018.
<https://www.psr.org/blog/resource/compendium-of-scientific-medical-and-media-findings-demonstrating-risks-and-harms-of-fracking/>

DEQ staff time to work closely with us on how to ensure the rejection by FERC of ACP's so flawed, incomplete, and false site data that totally erased CS 2 site information demographics and cultural history. Nor did we receive DEQ staff expertise to counter the Dominion's equally flawed, incomplete and misleading special use application, nor did DEQ staff employ their expertise to outright "fail" DEQ's first air permit filed in 2016. This despite Dominion reps' claims to Union Hill residents in meetings that their over 100-year history of building compressor stations and maintaining them has resulted in their being looked up to as leaders in this field. Why, if they can't write a passing air permit without years of our taxpayer support?

Mike Kiss, the DEQ air modeling expert who spoke with us yesterday, admitted it was "misleading" for Dominion representatives to over and over reiterate in the CS 2 special use permit process to the Buckingham Planning Commission and then Board of Supervisors that CS 2 will only have a "blowdown" once every five years. Because no one from the DEQ with their 20+ and 30+ years of expert knowledge was there to correct them, Dominion's "word" over-rode all of our citations of operational compressor stations that proved them wrong. Which then and now calls into question their right to expert status after 100 years of building compressor stations. Do we call this lying or deliberate misinformation? No matter, Dominion received their special use permit in an A1 Agriculture Zone, against our county Comprehensive Plan to protect farmland.

This comment asks you to consider what constitutes "expertise" then in your analyses of our comments, of DEQ's, of Dominion's? For, whoever is given "expert" status at every level of this permitting process and what constitutes factual, credentialed evidence are the central questions at stake in your decision-making. Is it an outdated EPA list of studies or 1300 of the latest independent science on fracked gas compressor stations as recent as 2018? Is it Dominion's claim that there are 29.6 people per square mile at the CS 2 site or is it a door-to-door household study over a one-year period of 99 households with a 76% response rate that finds a 600% higher population?

Dominion was given years of access to the Buckingham Board of Supervisors to supply misinformation about blowdowns, health impacts and jobs that already have not materialized in Buckingham. While each of us – the public, expert and impacted -- had 3 minutes to make a public comment in each local hearing, and never received a single direct response from BoS members about our many expert written comments that refuted Dominion's application "facts," pointed out their gaping omissions of necessary BACT and construction details. We pointed out many of the problems with Dominion's first air permit application we are now are told DEQ has worked years to try to solve. Some are not solved or solveable, as seen below in the list of expert comments and questions that remain unanswered about this air permit and its site.

By the amount of time spent by DEQ to "improve" the air permit, you can get a sense of how numerous and accurate were our expert objections over-ruled by the "expert" status given to any statement made by a Dominion representative to our local BoS instead. With 91 total public comments, 4 for and 87 against, the BoS unanimously approved the special use exemption for CS 2 in an A1 Agricultural Zone. A permit allowing a 54,000 hp (up to 57,000 in winter), metering and regulatory station, 125 ft. wifi tower, 3 above ground storage tanks at a 68-acre complex where the new ACP pipeline would intersect underground with the existing 4-pipeline Transco corridor in the middle of a huge wetlands where 100% of the drinking water is from individual wells close on every side of that complex.

We have all had to become citizen scientists. And, yet, when we give factual evidence, our data has not the leverage of the corporate applicant no matter how incomplete, in error, or even false.

Site Unsuitability: Environmental injustice, existing health conditions, social and economic costs to be paid by individuals and communities not ACP LLC

Far more concerning, if that is possible, from an environmental racism perspective, is the siting of the only Virginia ACP compressor station in a majority African American community, whose very existence, name, population, race, and former slave history has been erased from all ACP applications and reports, and from FERC's Final Environmental Impact Study-FEIS. As the person who designed, oversaw, analyzed and provided evidence to partners, including Friends of Buckingham's legal representative, Southern Environmental Law Center-SELN, and in public comments at every step of the permitting process for this CS 2 compressor station, for the ACP to FERC, to DEQ and Water Control Board, I provide evidentiary details below.

Dominion has consistently used misinformation about the factual population, race, and omission of historic cultural resources in submissions to Buckingham elected representatives, to FERC and DEQ. Misinformation that erases the name of the community, denser populated numbers of people living in close proximity, majority African American race, and erasure of their Former Slave and Freedmen history (as well as former plantation history) has shaped decision-making at every level of ACP's permit processes.

1. Dominion unfairly singled out Buckingham County from all counties along the three state route of ACP to claim it has "no historic resources" whether archaeological or architectural in that segment. Yet in all other counties, completely similar resources of early and mid-20th Century and 19th Century homes, churches and their cemeteries, bridges, dilapidated farm structures and stores, etc. were listed and photographed for 1674 pages. Alone, Buckingham's history was/is denied and erased.

- ❖ In Sept. 18, 2016 ACP filed a 1674 page cultural resource application to FERC. For Buckingham County only, ACP had "no recorded resources identified within the modified project APE" (Appendix D: 31).
- ❖ In March 24, 2016, ACP filed their Addendum of cultural resources. In Appendix D on P. 31, for Buckingham ACP reports only "three [total] resources are "documented within the modified project APE include three single-family dwellings that range in date from circa 1940 to circa 1965 . . . They have no known association with a significant event or person and are not associated with any broad patterns in history."
Pp. 330, 331, and 332 are photos of that list of homes/addresses: 330 & 331 **are the same home/same photo. 332 is not in Union Hill.** L. Fjord identifies 330/331 – the only cultural resources listed for the whole county of Buckingham - as Theo Haskins' on S. James River Highway, an abandoned trailer next to a modular home, without the family cemetery that adjoins it.
- ❖ That is, Dominion's contractors had to visibly ignore 99 homes on all sides of the CS 2 site, 2 historic black churches and their cemeteries (Union Hill Baptist est 1868; Union Grove Missionary Baptist est. circa 1920); 1 historic white church

and cemetery est. 1831, 2 historic black school sites, the 1880s Freedmen home place of the Harper family next to the proposed CS site, no photos of the Variety Shade tobacco barn or of Shelton Store, which is visible from the road in Union Hill.

- ❖ May 3, 2016, “Union Hill/Woods Corner Rural Historic District” Buckingham, VA was listed by Preservation Virginia as a “Most Endangered Historic Place” in Virginia. Notification of that listing and its complex of historic resources, marked and unmarked slave burials, churches, cemeteries, former plantation sites, farm structures, homes, photographs, and slave plantation neighborhood history have been part of public record of comments made to the Buckingham Planning Commission, the Buckingham Board of Supervisors, to FERC, by Dr. Lakshmi Fjord, Justin Sarafin and Sonja Ingram of Preservation Virginia since August 2016.

2. Dominion knowingly erased the existence of Union Hill as a known community, and its 99 households visibly within 150ft – 1-mile radius on all sides of their ACP VA compressor station site. In their 2015 FERC application and in all local and state permit processes both written and submitted at public hearings, ACP used the 2010 census average person per square mile data for the whole of Buckingham County – 29.6 – to report the population for ACP CS 2.

- ❖ On May 30, 2018, the spokeswoman for Dominion to the Governor’s Advisory Council on Environmental Justice claimed “it is the law” to do so -- when National Environmental Protection Act-NEPA guidelines state the opposite is true:

“The fact that census data can only be disaggregated to certain prescribed levels (e.g., census tracts, census blocks) suggests that pockets of minority or low-income communities, including those that may be experiencing disproportionately high and adverse effects, *may be missed in a traditional census tract-based analysis.*” ***Caution is called for in using census data due to the possibility of distortion of population breakdowns*** ... In addition to identifying the proportion of the population of individual census tracts that are composed of minority individuals, analysts should attempt to identify whether high concentration “pockets” of minority populations are evidenced in specific geographic areas. ... The IWG guidance also advises agencies not to ‘artificially dilute or inflate’ the affected minority population” (1997, 15-16).

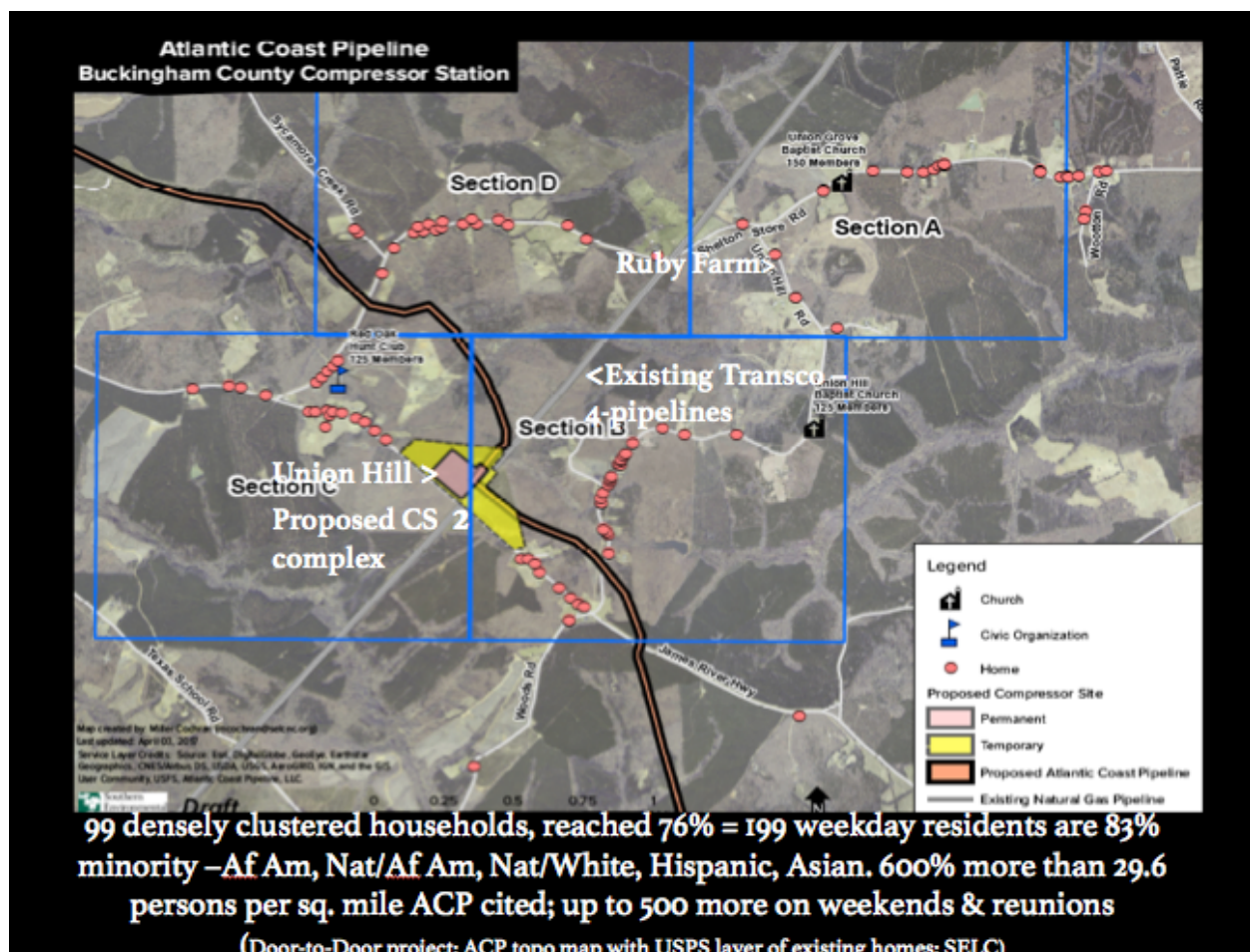
- ❖ The Union door-to-door household study of Union Hill designed and conducted by Dr. Lakshmi Fjord (UVa, Dept. of Anthropology) began in August 2016 to uncover the actual 1-mile radius demographic and historic data for the CS 2 site has had 3 stages for a total of 4 months, and ending Sept. 4, 2018. The study follows NIH protocols for health information confidentiality, and community research guidelines. Open-ended interviews of 1-1.5 hours took place in 67 of the 75 households reached. Data includes: factual population, race, ages, pre-existing diagnosed health conditions, family heritage in Union Hill and nearby, and existing economic or food source uses of their land.

ACP’s Buckingham CS site map found at dom.com, with a layer of household addresses added by Southern Environmental Law Center based on USPS postal

addresses, proves that Dominion always knew and could submit accurately that CS is not “sparsely populated,” is not 29.6 people per square mile.

- ❖ There are many cost benefits to Dominion to erase the population of Union Hill. By contravening NEPA guidelines, FERC in ACP's Final Environmental Impact Statement-FEIS reports no environmental justice issues besides low-income for the entire ACP route, which includes Union Hill-sited CS 2 (FEIS 4.9.9.1 Demographic and Economic Data, Vol 4-512). FERC notes their concerns if there were an African American majority population at this site:

“As discussed in section 4.11.1, air pollutants associated with ACP and SHP include increased dust as a result of construction equipment and vehicles, and compressor station emissions, which include carbon monoxide (CO), carbon dioxide (CO₂), methane, and nitrous oxide (NO_x); volatile organic compounds (VOCs); and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns (PM_{2.5}). These air pollutants are known to increase the effects of asthma³¹ and may increase the risk of lung cancer (Nafstad et al., 2003). Due to high rates of asthma within the overall African American community, we consider this community especially sensitive” (FEIS Vol 4:512)



- ❖ Union Hill household data including revised population, race, and existing diagnostic health conditions, is in the public record to Buckingham elected representatives, 2016-17; to FERC in EIS public comments by Dr. Fjord and by Southern Environmental Law Center (SELC), 2017; by Dr. Fjord in 401 Water permit comments and NW12 Water Board comments, 2017-18.
- ❖ Updated household data (Sept. 3, 2018 updates):
 - 75 of 99 households reached for a 76.5% response rate, an outstanding rate in social science research.
 - 199 weekday residents; with hundreds more on weekends, bimonthly, etc.
 - 83% are minorities: African American, Native American/African American, Native American/White, Hispanic, and Asian
 - 17% are White
 - Children 0-17 are 32%; Elderly are 25%
 - For 67 households, we have listed in the table existing diagnosed health conditions that would be impacted by the combination of emissions applied for at BCS, including particulate matter, radon, volatile organic compounds, and list of EPA emissions DEQ lists in their draft air permit for ACP.
 - Known pre-existing diagnoses at Union Hill, include diabetes, asthma and other lung conditions, chronic bronchitis and pneumonia, heart conditions, breast and other cancers, COPD, lupus, kidney disease, epilepsy, multiple sclerosis, brain tumor, migraines from 35 households in our study who responded to this pre-existing health conditions question.

3. The Air Pollution Control Board must consider that so far at the local and state level no “site suitability” study and accurate report has been placed in the public record by Dominion for Union Hill CS 2 compressor station. At every phase of the application process, Dominion has been allowed by Buckingham Board of Supervisors, by FERC, and DEQ to perpetuate the myth that BCS is a “sparsely populated” place when it serves them:

- i. to locate compressor stations 200 miles apart, non-industry standard;
- ii. to have shut off valve distances at 14.7 miles apart at this site, which is not Pipeline Hazard and Safety Administration-PHMSA standards for this population size but for a “sparsely populated” site;
- iii. to allow highest PSIS of pressure at this site;
- iv. to locate the intersection of the existing 4-pipeline Transco corridor with the new ACP pipeline in the middle of a huge wetlands;
- v. where 100% of the drinking water is from the aquifer shared with that wetlands, from individual water wells. In FERC FEIS: “The EPA defines a sole source aquifer or principal source aquifer area as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer, where contamination of the aquifer could create a significant hazard to public health, and where there are no alternative water sources that could reasonably be expected to replace the water supplied by the aquifer (EPA, 2016a).” Yet, despite public knowledge that Union Hill and Buckingham generally has no access to municipal water, has only individual wells for 100% of their water, FERC FEIS states: “There are only two EPA-designated sole

source aquifers in Virginia, but neither is in proximity to ACP facilities” (ACP FEIS 4.3.1.2 Sole Source Aquifers 4-78).

- vi. Where adverse visual effects from a 125 ft. wifi transmission tower and a metering and regulatory station were suddenly no problem. The CS 2 is all at once NOT sparsely populated, not rural.
“AC 2 FERC FEIS: Visual Impacts: 4.8.8.3 Aboveground and Ancillary Facilities 4-422 “The Compressor Station 2 is in a more populated area of Buckingham County that may be visible to more residents. However, the compressor station is located near previously developed residential and commercial areas and is consistent with the existing visual conditions in the area.”
- vii. where A1 agricultural zoning was exempted for heavy toxic polluting new industrial complex;
- viii. where there is scarce internet access, yet ACP will build a 125ft. wifi tower with lights that will interfere with the night sky. At local special use exemption public hearing for wifi tower, Dominion would not consider request by Union Hill community members for access to wifi -- as the only community benefit;

Most egregiously, ACP’s application, the local Board of Supervisors, and FERC have allowed Dominion to:

- ❖ Erase impacts on a minority community, and its particular and now rare in Virginia historic Freedmen community still living where their ancestors were enslaved;
- ❖ Erased that history in its cultural resource report, **only filed after Advisory Council on Historic Preservation (ACHP) wrote a rare comment of concern** about that complete omission to FERC;
- ❖ Erases need for closer study of the health impacts on this minority community which FERC in its ACP FEIS states would be concerned if BCS were a majority African American community. “ But, FERC stated it is not, using ACP’s census data not the expert data submitted by Dr. Fjord and SELC on actual population;
- ❖ 29.6 persons per square mile allow Dominion to have 75% thinner pipes and up to 500% longer shut off valve distances. For the BCS, FERC FEIS states valve distances are 15.6 miles apart vs. 2 miles for most populated areas. These benefits to the developer at the expense of impacted residents must not go on.

Site Suitability for the BCS, must now be the responsibility of the Air Control Board and the Governor because of the slave plantation legacy in Buckingham.

- ❖ Deliberate erasure of Buckingham Slave history began in 1869 when vigilantes burnt the courthouse to destroy records of enslavement, fearing Buckingham’s 2:1 majority former slaves’ voting for restitution.
- ❖ In ACP process, African Americans who spoke out against the special use permit have faced reprisals.
- ❖ Friends of Buckingham has ensured that our baseline testing of existing ambient air conditions and individual well-water testing in Union Hill tests as full a range

of the contaminants found at CS sites from independent studies; and we use Virginia certified labs. Why is Dominion allowed to use non-certified labs and not required to test that range of contaminants?

Why BCS must have a full CHIA (Comprehensive Health Impact Assessment): pre-existing conditions in Union Hill community call for environmental justice study of minority health impacts. Where are the studies to assure that the passage of the Transco Pipeline through this portion of Buckingham is not contributing to these medical conditions?

We refer the DEQ and Air Control Board to Dr. Larysa Dyrszka's expert comment already filed within the public comment period. Of which these are the key points:

1. The [Shale Health Impact Assessment \(HIA\) Template](#) is designed to give a structured way to bring together data on the community potentially impacted, the expected emissions from shale gas or oil development, and the potential health risks posed to residents in the immediate area. This tool can provide decision-makers with a comprehensive perspective on the siting, expanding, or maintaining of a shale gas or oil compressor station.
2. A "tons per year" measurement associated with the assessment of risk to the public's health near a compressor station is an archaic method, and does not address exposure adequately. Also, the National Ambient Air Quality Standards (NAAQS) used as a benchmark for air quality were not created to assess the air quality and safety in a small geographic area with fluctuating emissions. NAAQS effectively address regional air quality concerns. **But these standards do not adequately assess risk to human health for residents living in close proximity to polluting sources such as compressor station sites, where emissions can be highly variable.**
3. Thus, **There are concerns about the adequacy and quality of the air modeling study:**
 - ❖ Current protocols used for assessing compliance with ambient air standards do not adequately determine the intensity, frequency or durations of the actual human exposures to the mixtures of toxic materials released regularly at compressor stations.
 - ❖ The typically used periodic 24-hour average measures can underestimate actual exposures by an order of magnitude. There remains the risk of serious harm to human health, including lung disease.
 - ❖ Reference standards are set in a form that inaccurately determines health risk because they do not fully consider the potential synergistic combinations of toxic air emissions. Thus estimates of yearly totals of contaminants released by a compressor station do not allow for an assessment of the physiological impact of those emissions on individuals. NAAQS reflects what, over a region, over time, is deemed safe population- wide. This is very different than what is safe within for instance 1200 feet of this compressor station. Averaging over a year can wash out important higher spikes in emissions (thus exposures) that may occur at various points throughout the year.

- ❖ What is needed is continuous, minute-by-minute data on a suite of surrogate compounds being emitted.

4. Health risks from relevant air contaminants receive inadequate treatment.

- ❖ From studies of compressor stations that “met” NAAQ standards, the following problems were notated: health impacts from hydrogen sulfide, PM_{2.5} or carbonyls.
- ❖ Hydrogen sulfide was monitored continuously, documenting the variability of potential exposures, along with the average. Spikes of H₂S were quite high. Southwest Pennsylvania Environmental Health Study (SWP-EHP) has similar findings from measurements of PM_{2.5} near compressor stations. Particulate matter is not included in DEQ concerns, yet must be.
- ❖ There are other levels and types exposure around compressor stations that raise health concerns. In particular, acetaldehyde, benzene, formaldehyde, carbon tetrachloride, chloroform, 1,2-DCA and 1,1,2-trichloroethane, crotonaldehyde, and 1-methoxy-2-propanone exceeded their respective comparison values (CVs).
- ❖ Mixtures of pollutants are a critically important topic in addressing the public health implications of compressor stations. In fact, a very large number of chemicals are released together. NAAQ and Medical reference values are not able to take the complex nature of the shale environment, its multiple emissions and interactions into full consideration. Some mixtures like particular matter (PM) and volatile organic compounds (VOC) act synergistically to increase the toxicity of the chemicals.

5. The air permit treatment of Particulate Matter (PM) impacts in particular, but also of health impacts from compressors in general, is inadequate

- ❖ Particulate matter is known to impair lung function, aggravate asthma, cause high blood pressure and heart attack. PM can adhere with other compounds and then can carry these compounds, which may be toxic, into the deep lung and this is a health concern near compressor stations where multiple toxins are emitted with particulate matter (PM).
- ❖ Why is DEQ not adequately considering particulate matter, which will also be produced during the construction period, as well as daily during operations of BCS?
- ❖ Given that particulate matter (PM) causes respiratory damage and there are technologies available to scrub PM from air emissions, how can Dominion claim best available technology (BACT) if not scrubbing PM?

12. Radioactive waste is not considered in ACP air permit, we want it to be a state mandated emission concern. Because EPA region 3 reports that radium, measured as gross alpha and beta, in flowback water and produced waste in Pennsylvania wells, is significantly higher than in other shales.

- ❖ Graphs found in Dr. Dyrszka's comment -- from a USGS report -- illustrate the high radioactivity in Marcellus shale.
- ❖ Radon selectively and preferentially travel with the gas product, namely radon. As radon decays within the pipeline, the solid daughter elements, polonium and lead, accumulate along the interior of the pipes. There is a concern that the gas **transiting, and being compressed and regulated, will have radioactivity levels** which will put at risk not only the workers at these stations and along the pipeline, but potentially also to the residents. Radon, a gas, has a short half-life (3.8 days) but its progeny are lead and polonium, and these are toxic and have relatively long half-lives of 22.6 years and 138 days respectively.
- ❖ This air permit modeling does not address the potential health risks of the radon decay progeny.

13. **Sulphur Oxides and Hazardous Air Pollutants (HAPs) emissions seem to be higher in the 2018 permit** application when compared to 2017 estimates. How can Dominion claim best available technology (BACT) if they have selected new equipment that allows increases in these dangerous emissions?

14. Dominion's claim of best available technology (BACT) seems to involve selective capturing of methane, so how could DEQ assure these levels are lower to protect our health and reduce threats from climate change?

- ❖ Since climate change drilled down is daily and episodic direct impact from methane emitted -- plus all the other pollutants applied to for emission at CS #2, as they are breathed and drunk in water taken from 100% single source individual wells next to the CS #2 site?
- ❖ Methane is 86% more damaging to protective ozone than carbon dioxide. How does DEQ plan to require Dominion to accurately measure as well as to eliminate the release of methane into our community?

15. **Insufficient information about direction of air emissions** based on actual site conditions, rather than lab testing must be addressed

- ❖ Close by residents and those many miles away face new sources of large emissions that do have health impacts whether cumulative or by mixture.
- ❖ There air modeling done in laboratories have not been made clear enough to provide indicators of seasonal or daily peak exposures or minute by minute exposures based on geography.
- ❖ Many of our schools are within 10 miles of the compressor station. How will our children be protected?
- ❖ While baseline emission data from Roanoke, Hopewell, and other parts of the state might provide the best available baselines for air modeling, how can we be assured of the accuracy of pollution estimates, when the characteristics of these places are clearly different from Buckingham and DEQ is basing the majority of

these pollution estimates on unverified-in-real-life modeling outputs and laboratory testing?

- ❖ DEQ air modeling for the BCS is based on many assumptions about temperature, altitude, and other factors that are not accurate for Buckingham. Why was field data not collected? How can you assure test results and thus pollution estimates are accurate?
- ❖ How do you adjust for seasonal variability when assessing impacts of toxic pollutants on human health? For example, how do you take into account the higher exposure level of emissions that occur during the colder months when they stay closer to the ground?
- ❖ The "emergency" gas turbine, which raises the combined horsepower closer to 57,000 is intended for winter months. How is this accounted for in the air permit? Can we be assured that use of "emergency" is not being used to "hide" higher levels of emissions in winter

16. Please share with us the data documenting the current ambient air quality. What is the difference between the ambient air quality now in the air around the proposed project and what ACP applies to add to BCS site's present "higher than normal" air quality (quotation from ACP's "failed air permit"?)

17. ACP compressor stations do not follow industry standard for spacing: Since the recommended distance between compressor stations is usually less than 100 miles, why is the distance between ACP compressors so great, particularly since it concentrates dangerous pollution in the Union Hill and Woods Corner neighborhoods?

- ❖ Given that industry standard is to have compressor stations at shorter intervals, distributing risks and hazards more evenly over transmission distances. How does ACP explain that they have only one compressor station per state, and therefore these are very large and impactful as needed to provide the pressure to cover 200+ miles between CS #1 and CS #2 and CS #2 and CS #3?
- ❖ Given Dominion's past actions in other locations, we can anticipate that this compressor station will be expanded in the future. Unless the company can be prohibited from expanding in the future, why is this facility not considered a major source of pollution now so stronger standards are applied?

18. **Who Pays the true costs of these harmful emissions on health?** If community members get sick as a result of toxic emissions from the compressor station like formaldehyde, benzene, and hexane, would they be forced to sign non-disclosure agreements before receiving help with medical bills from Dominion Energy or Williams Transcontinental (Transco)?

19. **DEQ must require Dominion provides warnings for scheduled blowdowns.** How will nearby residents who have health issues be given sufficient time to leave the area

until the pollutants are reduced? How long will they have to plan to be away from the area to protect their health? What conditions might affect that time?

Local Emergency Response Capacity – it matters to emissions issues

20. We are worried about the inadequacy of local emergency response services in Buckingham and the highly pressurized, toxic, explosive, and flammable nature of the materials at BCS and in other ACP infrastructure. How will the state assure the safety of local residents?
21. How will Dominion use local knowledge of limitations in emergency response to make our system more robust? How can we be assured Dominion will not be allowed to set a standardized evacuation process that does not fit our local challenges and characteristics?
22. Many compressor stations start without clear evaluations plans. We know people currently living with compressor stations that have no local emergency plans. FERC does not enforce their provision. What steps can we take if Dominion Energy's promised evacuation plans are inadequate to assure public safety?

New Technology promises without warranty

23. The SOLAR manufacturer does not warranty or guaranty emission reductions in real life will approach levels found in modeling tests. SOLAR suggests any estimates must be treated as a range contingent on local variables. Given this careful language and the direct precaution in the SOLAR's sales materials warning against using their estimates in permitting decisions, why has there not been additional independent verification to assure estimates are accurate for Buckingham's local conditions?
24. **Since the new "green" technology Dominion bases their predicted emissions on has never been tested in the field and is taken from manufacturers' laboratory results** under generic conditions, is it not the best practice to hold the air permit application until the new technology has been tested in similar situations? For example, some of the proposed emissions controls have only been used with small turbines dissimilar to those proposed for BCS, isn't additional testing and use required before we can trust the manufacturer's claims?

Increased Gas transmission and emissions without community knowledge?

25. Could ACP increase the amount of gas compressed in the BCS in the future without additional air permitting?
26. Can increases in Transco gas compression in Buckingham move through the compressor without being regulated in an air permit?
27. Would impacted residents be consulted prior to future decisions about increases in gas transportation through the BCS or can DEQ approve increases without community knowledge or input?

Respectfully submitted,
Lakshmi Fjord, PhD.

Resources for the Air Control Board on fracking and health impacts

Physicians for Social Responsibility-PSR, Philadelphia has designed an innovative training event on fracked gas and its health effects. The event is a “speed learning” event using the PechaKucha technique of multiple, extremely brief presentations: 20 images at 20 seconds each.

As the event will be live-streamed, I urge you to sign up now and tune in to the event, Saturday, October 13, 9 am – 4 pm eastern time. and registration:

- Website (<https://www.psrphila.org/pa-health-check-up-series>)
- Registration Form (http://weblink.donorperfect.com/pa_health_checkup1)

References Cited

Executive Order 12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 59 FR 7629; February 16, 1994

<https://www.epa.gov/laws-regulations/summary-executive-order-12898-federal-actions-address-environmental-justice>

Environmental Justice Guidance Under the National Environmental Policy Act

Council on Environmental Quality, Dec. 10, 1997

<https://www.energy.gov/nepa/downloads/environmental-justice-guidance-under-nepa-ceq-1997>

Fjord, Lakshmi Ph.D. 2018. *Summary Report, Cvllle People's Tribunal on Human Rights and Environmental Justice Impacts of Fracked Gas Infrastructure (ACP and MVP)*, presentation and document submitted to the International Peoples' Tribunal on Human Rights, Fracking, and Climate Change, May 14-18, 2018 ([tribunalonfracking](http://tribunalonfracking.com))

[All Cvllle People's Tribunal publications, testimonies, and videos available at: vapeopletribunal-humanrightsenvironmentaljusticeimpactsfrackedgas.com]

Fjord, Lakshmi, Ph.D. 2015 – 2018. Written and Oral Public comments in the public record

1. Buckingham Board of Supervisors, expert comment on ACP issues related to health, economics, jobs, race, and history, March 9, 2015, by mail.
2. FERC, intervenor, request for consulting party status, public comment, Union Hill Historic Preservation Act Section 106 violations by ACP, June 2, 2016, submitted online
3. FERC, intervenor, request for consulting party status, public comment, Yogaville Historic District, HP Section 106 issues by ACP, June 2, 2016, submitted online
4. Buckingham County, Planning Commission, Sept. 9, 2016
5. Buckingham County, Board of Supervisors, Special Use Permit Public Comment period and hearing, January 3, 2017.
6. FERC DEIS Written public comment, filed April 6, 2017; submitted online at FERC.
7. FERC DEIS Public Hearing, Farmville, VA,
8. VDEQ 401 Water Permit Public Comment filed August 22, 2017; emailed and sent by mail.
9. VDEQ 401 Water Permit Public Hearing, Farmville, VA, August 10, 2017; in person.
10. VDEQ Buckingham Compressor Station Air permit public comment, online.

PHMSA - Pipeline and Hazardous Materials Safety Administration, <https://www.phmsa.dot.gov/>



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Ken Fox <Ken.Fox.106239513@p2a.co>
Reply-To: Fox196@aol.com
To: Ann Regn <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 4:19 PM

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Ken Fox
[55 Massie Dr NW](#)
[Christiansburg, VA 24073](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

John Furr <John.Furr.126639814@p2a.co>
Reply-To: jaf5023@outlook.com
To: Ann Regn <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 4:40 PM

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
John Furr
[7145 Oak Dr](#)
[Reva, VA 22735](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station for the At. Coast Pipeline - Air Quality Permit1 message

Peg Futrell <peg.futrell@outlook.com>

Fri, Sep 21, 2018 at 10:40 AM

To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>

Dear members of the Department of Environmental Quality:

All Virginians depend upon your decisions to ensure the quality of our air and water. I have this to say about the Atlantic Coast Pipeline in general, and the compressor station specifically.

DEQ officials have stated that the Department and the Board lack authority to consider issues related to the need for the project and proper siting of the station. The State of Virginia not only has that authority, it has a solemn obligation to exercise it, according to the Code of Virginia § 10.1-1307.E. and includes:

- The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused;
- The social and economic value of the activity involved;
- The suitability of the activity to the area in which it is located; and
- The scientific and economic practicality of reducing or eliminating the discharge resulting from such activity.

Note that there is NO PROVEN NEED for the Pipeline and Compressor Station, as unearthed by evidence proving Dominion's claims about the need for gas supplied by ACP to be false. DEQ must acknowledge this information and incorporate it into its analysis of Dominion's application for the air permit.

Note also that the Advisory Council on Environmental Justice (ACEJ) recommended not one month ago, that the "Governor direct DEQ to suspend the permitting decision for the air permit for the Buckingham compressor station pending further review of the station's impacts on the health and the quality of life of those living in close proximity." See ACEJ letter, dated August 16, 2018, at Environmental Justice Review of Virginia's Gas Infrastructure. The ACEJ also recommended Governor Northam convene an Emergency Task Force on Environmental Justice in Gas Infrastructure. See article about the ACEJ's action at Governor's Advisory Council Call for Moratorium on Atlantic Coast and Mountain Valley Pipelines, Global Justice Ecology Project, August 29, 2018.

Please deny this permit and demand that the egregious omissions of facts and considerations are fully and satisfactorily addressed by the applicants. We Virginians depend upon you to ensure our needs for environmental fairness, justice and clean air and water are addressed and met.

Regards, Peg Futrell, Gainesville, Va.



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham - proposed compressor station

1 message

Molly Gauthier <mollycgauthier@gmail.com>

Fri, Sep 21, 2018 at 8:44 AM

To: airdivision1@deq.virginia.gov

Re: The ACP compressor station proposed for Union Hill.

1. The project is not needed.
2. The project unfairly targets communities of color and impacts Virginia's most vulnerable populations. These areas have unusually large percentages of elderly people and children, who are especially sensitive to toxic emissions in the air, especially during periodic "blowdown" periods, where the air quality is impacted for up to a 15 mile radius.
3. DEQ has failed to properly consider these impacts.

I hope you will follow the governor's Advisory Council on Environmental Justice and suspend the permitting decision pending further review of the station's impact on the health and quality of life of the people who would be close to this loud, stinky, toxic monstrosity.

Sincerely,
Molly C. Gauthier
[2146 Mt. Torrey Rd.](#)
[Lyndhurst, VA 22952](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Steve George <Steve.George.116806387@p2a.co>

Fri, Sep 21, 2018 at 8:05 PM

Reply-To: sageorge24094@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a "minor" source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to "minor" sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Steve George
[1063 Greenview Dr](#)
[Basye, VA 22810](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Bobby Gordon <Bobby.Gordon.112303037@p2a.co>

Fri, Sep 21, 2018 at 10:35 PM

Reply-To: gordonba@aol.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a "minor" source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to "minor" sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Bobby Gordon
[9303 Donora Dr](#)
[Richmond, VA 23229](#)



Deny the Buckingham Compressor Station air permit

1 message

Becci Harmon <bharmon3892@gmail.com>

Fri, Sep 21, 2018 at 6:50 PM

Reply-To: bharmon3892@gmail.com

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

WE ARE UNION HILL

I respectfully urge you to deny the draft minor source air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station.

This compressor station poses a direct threat to our climate, our air quality, and - most importantly - to the lives of the historic freedman and largely African American Union Hill community. If built, the compressor station would emit methane, nitrogen oxides, volatile organic compounds and particulate matter into the air in close range to community members' homes and would be a stark example of environmental racism at play in the Commonwealth.

We ask that you deny this permit and request that the following concerns be addressed:

- DEQ and the Air Board must ensure that the permit for the Buckingham Compressor Station does not disproportionately impact marginalized communities. However, the vast majority of residents in close proximity to the proposed compressor station site - 85% - are people of color, and a large proportion are elderly or very young. Therefore, a disproportionate impact on an environmental justice community is virtually guaranteed. If the project cannot be modified to avoid this outcome, the air permit should be denied.
- ACP has not shown that the amount of toxic air emissions from the compressor will not cause or contribute to the endangerment of human health. DEQ should conduct a baseline Health Impact Assessment to better understand what ailments already exist in the community that could be exacerbated by these emissions. The elderly, very young, and community members who already have respiratory health issues are particularly at risk.
- DEQ should require ACP to continuously monitor nitrogen oxide emissions to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ should conduct further analysis of the greenhouse gas emissions associated with this proposed compressor station. While Virginia is poised to begin regulating carbon dioxide emissions from electric power plants, ignoring the greenhouse gas emissions from the infrastructure used to supply those power plants is self-defeating. With each new pipeline and compressor station built, significant amounts of methane are emitted into the atmosphere, exacerbating climate change impacts. Though methane does not last in the atmosphere nearly as long as carbon dioxide, methane is much more efficient at capturing radiation than carbon dioxide and, pound for pound, the comparative impacts of methane to carbon dioxide are 25 times greater over a 100 year period. Greenhouse gas emissions are mentioned in the draft air permit, but further analysis of impacts and plans to mitigate those emissions are necessary.
- ACP has not adequately addressed emergency response plans. Detailed plans should be drafted and shared with the community. These plans should outline evacuation and actions in response to an explosion or other emergency at the Buckingham compressor station. At this time, there is no certainty that residents could be evacuated promptly, and Buckingham County emergency responders do not have the supplies or resources to respond to a significant industrial emergency.

It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station. I urge you to deny the permit.

Sincerely,

Becci Harmon
3892 Morris Mill Rd
Swoope, VA 24479
5404906089



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Donald Hedgebeth <Donald.Hedgebeth.125203223@p2a.co>

Fri, Sep 21, 2018 at 7:14 PM

Reply-To: dhedgebeth2@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Donald Hedgebeth
[134 Deep Run Rd](#)
[Hampton, VA 23666](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Comment on Compressor Station

1 message

Tim Hickey <timhickeyteacher@gmail.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 1:40 PM

My name is Tim Hickey & I live at 4765 Ragged Mountain Ln Charlottesville VA 22903 United States. My number is (434) 566-3382.

I vehement oppose this poisonous, pointless compressor station slated to be built in Union Hill. After being deemed too toxic for U.S. Forest Land, it's proposed site was moved to a historic Black neighborhood. That is despicable & un-American. Period.

This station will be jet engine loud & spew volatile and organic compounds. How far exactly will the wind carry these toxins? What e exactly will be the effects in our children? On the wildlife? On our ecosystem?

This is a horribly mismanaged process & the air permit should be rejected. It's a no brainer. Do the right thing. Thank you.

-Tim Hickey

Sent from my iPhone



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Barbara Hoggood <Barbara.Hoggood.112648125@p2a.co>

Fri, Sep 21, 2018 at 4:23 PM

Reply-To: bhogg9163@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Barbara Hoggood
[4306 Sunset Dr](#)
[Petersburg, VA 23803](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Rodney Holmes <Rodney.Holmes.107648095@p2a.co>

Fri, Sep 21, 2018 at 5:56 PM

Reply-To: rodneyrayholmes@aol.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Rodney Holmes
[11212 Sterling Cove Dr](#)
[Chesterfield, VA 23838](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Joseph Horne <Joseph.Horne.43064058@p2a.co>

Fri, Sep 21, 2018 at 9:52 PM

Reply-To: noelhorne.jnh@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Joseph Horne
[4045 Sadler Dr](#)
[Suffolk, VA 23434](#)

Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Robert Hottinger <Robert.Hottinger.6602844@p2a.co>

Fri, Sep 21, 2018 at 4:23 PM

Reply-To: bhottinger90@gmail.comTo: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Robert Hottinger
[53 Teaberry Pl](#)
[Fishersville, VA 22939](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

William Howard <William.Howard.126679720@p2a.co>

Fri, Sep 21, 2018 at 4:24 PM

Reply-To: weh2010@hotmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
William Howard
[16590 Pouncey Tract Rd](#)
[Rockville, VA 23146](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Frank Hudgins <Frank.Hudgins.107630779@p2a.co>

Fri, Sep 21, 2018 at 5:18 PM

Reply-To: fhudgins@verizon.net

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Frank Hudgins
[408 Granada Dr](#)
[Chesapeake, VA 23322](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

laura hunter <laura.hunter.85989731@p2a.co>

Fri, Sep 21, 2018 at 7:38 PM

Reply-To: dakota1015lh@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
laura hunter
[6108 Almond Creek Ln](#)
[Richmond, VA 23231](#)

**Deny the Buckingham Compressor Station air permit**

1 message

Patricia Hyde <pahyde@cox.net>

Fri, Sep 21, 2018 at 5:42 PM

Reply-To: pahyde@cox.net

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

I respectfully urge you to deny the draft minor source air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station.

This compressor station poses a direct threat to our climate, our air quality, and - most importantly - to the lives of the historic freedman and largely African American Union Hill community. If built, the compressor station would emit methane, nitrogen oxides, volatile organic compounds and particulate matter into the air in close range to community members' homes and would be a stark example of environmental racism at play in the Commonwealth.

We ask that you deny this permit and request that the following concerns be addressed:

- DEQ and the Air Board must ensure that the permit for the Buckingham Compressor Station does not disproportionately impact marginalized communities. However, the vast majority of residents in close proximity to the proposed compressor station site - 85% - are people of color, and a large proportion are elderly or very young. Therefore, a disproportionate impact on an environmental justice community is virtually guaranteed. If the project cannot be modified to avoid this outcome, the air permit should be denied.
- ACP has not shown that the amount of toxic air emissions from the compressor will not cause or contribute to the endangerment of human health. DEQ should conduct a baseline Health Impact Assessment to better understand what ailments already exist in the community that could be exacerbated by these emissions. The elderly, very young, and community members who already have respiratory health issues are particularly at risk.
- DEQ should require ACP to continuously monitor nitrogen oxide emissions to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ should conduct further analysis of the greenhouse gas emissions associated with this proposed compressor station. While Virginia is poised to begin regulating carbon dioxide emissions from electric power plants, ignoring the greenhouse gas emissions from the infrastructure used to supply those power plants is self-defeating. With each new pipeline and compressor station built, significant amounts of methane are emitted into the atmosphere, exacerbating climate change impacts. Though methane does not last in the atmosphere nearly as long as carbon dioxide, methane is much more efficient at capturing radiation than carbon dioxide and, pound for pound, the comparative impacts of methane to carbon dioxide are 25 times greater over a 100 year period. Greenhouse gas emissions are mentioned in the draft air permit, but further analysis of impacts and plans to mitigate those emissions are necessary.
- ACP has not adequately addressed emergency response plans. Detailed plans should be drafted and shared with the community. These plans should outline evacuation and actions in response to an explosion or other emergency at the Buckingham compressor station. At this time, there is no certainty that residents could be evacuated promptly, and Buckingham County emergency responders do not have the supplies or resources to respond to a significant industrial emergency.

It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station. I urge you to deny the permit.

Sincerely,

Patricia Hyde
115 S Curry Str
Hampton, VA 23663
7049322527



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Deborah Johnson <Deborah.Johnson.107750488@p2a.co>

Fri, Sep 21, 2018 at 4:22 PM

Reply-To: deborah0304@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a "minor" source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Deborah Johnson
[13762 Fleet St](#)
[Woodbridge, VA 22191](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

David Jones <David.Jones.12281385@p2a.co>
Reply-To: tinmanjones007@yahoo.com
To: Ann Regn <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 6:13 PM

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
David Jones
[12504 Henkins Ln](#)
[Spotsylvania Courthouse, VA 22551](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Delegate Mark Keam's letter about compressor station

1 message

Mark L Keam <DelMKeam@house.virginia.gov>

Fri, Sep 21, 2018 at 4:01 PM

To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>

Good Afternoon,

I have attached a letter outlining my concerns about the ACP compressor station being planned in Union Hill.

Regards,

A handwritten signature in blue ink that reads "Mark".

Delegate Mark Keam
Office of Delegate Mark L. Keam
Virginia House of Delegates
35th District
P.O. Box 1134
Vienna, VA 22183-1134
District Office: (703) 350-3911
Richmond Office: (804) 698-1035
DelMKeam@House.Virginia.Gov
www.DelegateKeam.org

**Del Mark Keam letter re ACP Compressor Station 9-21-18.pdf**

179K



MARK L. KEAM
POST OFFICE BOX 1134
VIENNA, VIRGINIA 22183

THIRTY-FIFTH DISTRICT

COMMONWEALTH OF VIRGINIA

HOUSE OF DELEGATES
RICHMOND

COMMITTEE ASSIGNMENTS:
EDUCATION
FINANCE
COMMERCE AND LABOR
AGRICULTURE CHESAPEAKE AND NATURAL
RESOURCES

September 21, 2018

VIA EMAIL TO: airdivision1@deq.virginia.gov

Commonwealth of Virginia
Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Rd
Glen Allen, VA 23060

Re: State Air Pollution Control Board Permit for Buckingham Compressor Station

To whom it may concern:

I respectfully request the Department of Environmental Quality (DEQ), and the State Air Pollution Control Board (Board) to deny the air pollution permit for the Atlantic Coast Pipeline's compressor station proposed in Buckingham County.

This compressor station is designed to produce 54,000 horsepower, which is one of the largest ever proposed by Dominion Energy. A compressor of such huge magnitude spewing out toxins into the air threatens the health of the residents of Union Hill. Therefore, I urge the Board and DEQ immediately to complete a thorough risk assessment prior to any permitting and to work with other state agencies to conduct comprehensive health risk and impact assessments at the beginning of future permitting processes.

I also oppose the issuance of the permit because I believe the information presented to the government is incomplete and/or misleading in material ways. For example, DEQ's Intra-Agency Memorandum analyzing the draft permit states that a site evaluation led the agency on October 31, 2017, concluded that the area surrounding the site was "sparsely populated." However, research done by local community groups indicates that the area immediately nearest to the proposed compressor station is more densely populated than DEQ's report suggests.

I have personally been to the proposed site myself and have met with numerous residents who live close to the location who shared their concern that their physical presence is not accounted for in the reports presented to the government, and that they are fearful of the health risks they face in the event of an emergency arising out of the compressors.

A particularly significant concern to me is the fact that this community of residents in Union Hill is 85 percent African American, including two historic African American Baptist churches. This community is of tremendous historic significance to the story of the Commonwealth of Virginia. Union Hill was the home of some of America's first freed slaves, and it remains the home of many of their descendants.

Placing a compressor station of an unprecedented magnitude in the Commonwealth, with imminent danger of toxic leaks of methane, nitrous oxides, particulate matter and other volatile organic compounds just miles from their homes and schools, would appear to violate principles of environmental justice.

I note that the Governor's own Advisory Council on Environmental Justice share my concerns over racially discriminatory impact of this proposal. In May, the Council met with dozens of residents in Buckingham County who are living in fear of another set of health and environmental hazards anticipated from the pipelines. Based on the economic and racial demographic disparities, the Council unanimously issue a letter to Governor Northam stating that placing a compressor station in Union Hill would be a form of environmental racism.

The DEQ and the Board have unique and critical responsibilities to protect our most vulnerable citizens from the dangers of fossil fuel pollution. Knowing what we know about the risks to citizens at this stage of the proposal, I believe the most responsible decision is for the DEQ and the Board to deny the air permits for these projects.

Finally, I urge the DEQ and the Board to extend the public comment period for this permit to October 8, 2018, to allow for full and fair consideration of the many questions that have been raised.

Thank you for your time and consideration of this very important matter.

Sincerely,



Mark L. Keam
Member, House of Delegates



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Air Permit application

1 message

Suzanne Keller <sjkeller.ma@gmail.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 1:28 PM

Dear APCB,
I am submitting comments on the proposed Buckingham Compressor Station.

best regards,

Suzanne J. Keller
3014 Landria Drive
Richmond, VA 23225
804-266-4313



A_SJK_comment_APCB_Virginia Department of Environmental Quality.pdf
345K

Virginia Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Rd
Glen Allen, VA 23060

September 20, 2018

Dear Members of the Air Pollution Control Board,

I write to submit public comment on the proposed air permit for the Buckingham compressor station of the Atlantic Coast Pipeline. I have recently retired from the Virginia Department of Health where I worked for nearly 30 years as an epidemiologist. I ask that you deny the permit for the reasons outlined below. As you consider this permit, I pray that you take seriously the section of the Virginia code that spells out the duties of the Board.¹ In particular, you must consider the health and safety of the 99 households within a mile of the proposed compressor station. Your fellow Virginians are counting on you to protect the health and safety of the Union Hill community as well as all Virginians who want clean air and a clean energy future.

I have had extensive discussions with DEQ staff, I attended the public information session in Buckingham County and I have spent quite a bit of time reviewing the air permit and air modeling report. There are significant problems with the air permit that I have identified and will describe in detail below.

I. Process

A. The DEQ and Dominion Energy spent nearly 3 years in conversation refining and improving the draft permit. The permit was released online to the public on August 8th with a 30 day comment period ending September 11, 2018, now extended to September 21, 2019. The citizens most impacted by the construction and operation of this facility have not been given adequate notice or time to review the permit and associated documents. Internet service in Buckingham County is not optimal and many people have no internet access. The documents were provided to the Buckingham County library, but did not arrive at the library until August 24th, originally giving residents only 18 days to review and comment on the permit. While I appreciate the extension of the comment period, it still does not address the

¹ Code of Virginia § 10.1-1307, Section E. Among other things the Board is to address the following: 1. The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused; 2. The social and economic value of the activity involved; 3. The suitability of the activity to the area where it is located; and 4. The scientific and economic practicality of reducing or eliminating the discharge resulting from such activity.

larger question of timing and access. **I respectfully request that the comment period be extended 30 days from 9/21/2018.**

B. The DEQ, plans to control the type and amount of information provided to you, our citizen air board.

From Patrick Corbett's Briefing :

"Steps before Board Consideration

- Public Comment Period - Comments received between August 8th and September 11th including comments at the public hearing
- DEQ reviews, considers, and responds to all public comments
- DEQ makes any necessary changes to permit documents
- DEQ proposes final draft"

I am concerned that this process will exclude the comments by residents most impacted by the compressor station and that it will exclude all public health impacts that I intend to present to you. It allows DEQ to decide what information you will receive and removes from the Board the ability to make an informed decision about the permit.

B. The DEQ did not conduct an environmental justice review of the proposed compressor station as required by federal law as DEQ receives federal funds for its operations. As a result, the people of Union Hill, most of whom are minorities were erased from consideration by the Commonwealth of Virginia. The Governor's Advisory Council on Environmental Justice charges that the location of the compressor station is environmental racism. The Blue Ridge Environmental Defense League (BREDL), filed a Title VI civil rights complaint with the EPA.

C. The DEQ insists that only technical comments about the air permit will be reviewed and provided to the Board. This narrow interpretation of the DEQ's and the Board's duty to protect air quality limits consideration of the social, economic, health, safety, scientific and location elements of § 10.1-1307, Section E. Indeed the idea that citizens should be limited to technical comments, especially those most impacted is unfair to the residents of Union Hill and to all citizens of Virginia who care about clean air.

Per § 10.1-1307, the AIR Board should consider the "suitability of the activity to the area where it is located." In conversations with DEQ staff and in Pat Corbett's presentation I learned that DEQ defers to the locality on siting issues and that siting would not be considered by the AIR Board in its review of the permit.

I am very concerned about the state ceding its authority to determine air quality to a local Board of Supervisors that has limited knowledge and no expertise in this area. The special use permit (SUP) is currently being challenged in the Supreme Court of Virginia as to its legality and may be vacated by the Court. Even if the SUP permit

stands, the AIR Board now knows that there are 99 households within a mile of the proposed facility and it should protect the health and safety of the community.

AIR Modeling Report

- A. I found errors in the modeling report regarding the existing air pollution as reported in the National Emissions Inventory database. I did ask DEQ specifically if all of the inputs had been checked by DEQ staff, and I was assured this had been done. Finding errors like this raise questions about the validity of the modeling report and its conclusions. Specifically the NO_x and CO tons were incorrect in Table 3-5.
- B. The air modeling does not consider intensity and duration of exposures to the human beings and animals who live near the compressor station. Despite the absence of this kind of data, the report claims that the health of the community will be protected. See p. 26 of the Air Modeling Report where this conclusion is reported: "This indicates that the proposed Project will not adversely affect human health." This conclusion is based on two things: the NAAQS for the region will not be exceeded and the concentration of hexane and formaldehyde will not be exceeded.

These standards are not sufficient to protect human health on the ground in Union Hill. Regional air quality standards do not tell us anything about the impact on individuals or their vulnerability to the proposed emissions. The claim that the project will not adversely affect human health is unsupported by any evidence.

The Union Hill neighborhood has already suffered health impacts from four years of impending threats from pipeline construction, construction of the compressor station, and construction of man camps. Stress, sleep deprivation, emotional distress and loss of quality of life are already found on the borders of the compressor station property and in the path of pipeline.

- C. Dominion continues to present the total Buckingham population and persons per square mile to argue that there will be little impacts from emissions as the population is lower than monitored sites (p. 15-16). This allows Dominion to once again erase the residents of the Union Hill/Woods Corner neighborhoods from consideration. By July 2018 Dominion knew that there were 99 households within a mile of the proposed compressor station. They should not continue to erase these citizens and they certainly cannot claim to protect their health with a model that erases them once again.
- D. The air modeling report argues that the background air pollution in the locations where there are air monitors have greater population and more air pollution, therefore the air model results will be conservative, that is they

will over estimate the air pollution impacts for the criteria pollutants. I am skeptical about this conclusion. The modeling report promotes the idea that Dominion is doing more than necessary or that it is surpassing the requirements to insure the wellbeing of the community. These claims are not science, they are a carefully orchestrated public relations campaign to justify emissions that actually can be avoided altogether by denying the permit.

- E. To illustrate the burden of pollution is actually higher than the burden in most of the monitored sites, see Table 1 below. I take the data from the air modeling report and calculate tons per capita to illustrate the disparity in Buckingham. As you can see, the only location where the per capita burden of these pollutants is great than Buckingham County is Hopewell, Virginia, arguably the most polluted locality in Virginia. Rural locations like Buckingham are not treated fairly in these models.

Table 1. Burden of Pollution in Buckingham County and Air Monitor Sites: Tons Per Capita*

Monitor Station	County	Population	Nox	CO	PM2.5	Pm10	Total Tons	Tons/Per Capita
(Project Site)	Buckingham	17,048	636	5,412	440	1,835	8323	0.49
Harrisonburg	Rockingham County	79,744	3104	22841	2075	7863	35883	0.45
Richmond	Richmond City	223170	5497	26151	772	1848	34268	0.15
Henrico County	Henrico County	326501	6810	37888	1067	2710	48475	0.15
Vinton	Roanoke County	94031	2220	12781	538	1789	17328	0.18
Hopewell	Hopewell City	22735	9708	4421	541	976	15646	0.69
Albemarle County	Albemarle County	106878	3265	17881	1012	4250	26408	0.25
Lynchburg	Lynchburg City	80212	1725	10153	576	1294	13748	0.17

*Data taken from the Dominion Air Modeling Report Table 3-4 Population Data for Background Monitors and Table 3-5 Emissions from Buckingham County and Surrounding Counties with Air Quality Monitors except for Buckingham Nox and CO values from NEI, 2014 accessed 9/9/2018.

Health Impacts

While there a growing body of literature, nearly 685 articles on the health impacts of unconventional natural gas infrastructure,² for compressor stations the health impacts come community based research, clinical observations and surveys of

² Hays J, Shonkoff SBC (2016) Toward an Understanding of the Environmental and Public Health Impacts of Unconventional Natural Gas Development: A Categorical Assessment of the Peer-Reviewed Scientific Literature, 2009-2015. PLoS One 11(4): e0154164, doi 10.1371/journal. Pone 0154164. Accessed 5/21/2018. This paper demonstrates that the weight of the findings in the scientific literature indicates hazard and elevated risks to human health as well as possible adverse health outcomes associated with unconventional natural gas development.

existing emissions. Nevertheless as we think about the health impacts it is clear that the permit as it stands is inadequate to be protective.

In a study of risks to humans from unconventional natural gas development, Brown and colleagues critique the assumption that regional ambient air standards compliance protects individual health.³ They pose the following questions that remain unanswered in the air permit, the air permit application and the air modeling report.

“What matters from a health perspective is the content and intensity of exposures at the individual level. The critical questions are: What is a person, in a given household, exposed to? How high do those exposures climb? How often is that resident exposed to these high levels? What happens physiologically when a particular toxic comes in contact with the body?”

The air permit does begin to answer or even assess these critical questions about exposures.

The permit purports to limit emissions for compliance with regional air quality standards, but it is silent on the *actual exposures* that people residing nearby will experience when peak emissions occur, such as start up and shutdowns, blowdowns and pigging events.

Minisink Compressor

In a project requested by the community the Environmental Health Project collected data on particulate matter and VOCs as well as health information.⁴ The Minisink compressor is a 12,000 hp station in New York.

The most frequently reported health impacts included respiratory, neurological and dermatological problems. In addition, overall mental health and wellbeing levels were below normal for half of the respondents.

The results of monitoring for PM_{2.5} outside the residents found elevated PM_{2.5} in baseline values for outside ambient air compared to the regional levels. In addition, episodic elevation of PM_{2.5} occurred, and though outside levels were below the EPA level of concern, one home had an average above the EPA standard.

³ David R. Brown, Celia Lewis & Beth I. Weinberger (2015) Human exposure to unconventional natural gas development: A public health demonstration of periodic high exposure to chemical mixtures in ambient air, *Journal of Environmental Science and Health, Part A*, 50:5, 460-472, p. 461 DOI: 10.1080/10934529.2015.992663

⁴ Southwest Environmental Health Project, Summary of Minisink Monitoring Results. <https://www.environmentalhealthproject.org/resources/17/click/5>; accessed 9/19/2018

Chemical samples were taken outside of four homes. “The levels of reported VOCs were not high in terms of health effects for a single chemical exposure, but are still of concern if these exposures occur over a long period of time of high spikes periodically occur “ (p.3).

This case study demonstrates that unhealthy levels of PM2.5 may occur periodically and that exposures to VOCs and PM2.5 do occur among residents living within a few kilometers of the compressor station.

I spoke with investigators from ASTDR who provided information regarding two investigations that they conducted where high levels of PM2.5 were found.

Brooklyn Township Health Consultation:

In this report, ATSDR evaluated PM2.5 levels at a residence near a compressor station in NE PA. The monitored PM2.5 levels were found to be of concern for sensitive subpopulations. The PM2.5 levels measured at the residence were higher than the levels detected at the regional NAAQS monitor further away from the compressor station:

https://www.atsdr.cdc.gov/HAC/pha/BrooklynTownship/BrooklynTwnsp_pm2-5_HC_Final_04-22-2016_508.pdf

Brigich Compressor Station Exposure Investigation:

For this evaluation, ATSDR collaborated in an air sampling/monitoring effort with EPA measuring carbonyls, reduced sulfur compounds, hydrogen sulfide, PM2.5, and VOCs over ~2-3 months in 2012 near the Brigich Compressor Station in SW PA. As we mentioned, we found most of the air results would not be of public health concern, but we did highlight the PM2.5, hydrogen sulfide, and aldehydes as possibly of concern for sensitive populations:

https://www.atsdr.cdc.gov/HAC/pha/Brigich_Compressor_Station/Brigich_Compressor_Station_EI_HC_01-29-2016_508.pdf

Russo and Carpenter inventoried every pollutant from compressor stations in New York to provide a snapshot of the scope and volume of pollutants associated with compressor stations.⁵ In this comprehensive survey, the authors catalogue health impacts of chemicals and document the tons of pollutants released by compressor stations. They conclude, “The potential health impacts of the large volumes of pollutants generated by natural gas compressor stations have not been addressed, let alone answered, by those arguing for their construction and expansion.”

⁵ Russo, PN, Carpenter, DO, Health Effects Associated with Stack Chemical Emissions from NYS Natural Gas Compressor Stations: 2008-2014. October 2017.
https://www.albany.edu/about/assets/Complete_report.pdf accessed 5/24/2018

Environmental Justice

The siting of an industrial facility that will emit toxic pollution 24/7 in the historic Freedman community of Union Hill is a glaring example of environmental racism. We must not repeat the mistakes of the past and continue a horrible legacy of placing the burden of these projects on the backs of minority communities. Justice demands that the air permit be denied for the peace and tranquility of this community will be damaged forever. The Code of Virginia, § 10.1-1307, Section E, should guide the Board's decision even if the air permit meets regional air quality standards.

The documents in support of this application, including the air modeling report, the application for the permit, and the engineering analysis continue to erase the residents of Union Hill from consideration. They all repeat the false narrative that this is a sparsely populated landscape. They all erase the people of Union Hill.

Conclusion

I do not believe that you (APCB) have sufficient information to assess whether this permit will protect the **health and safety** of the people who live in its shadow. Regional air quality standards will not protect vulnerable and sensitive populations who live in the proximity of the compressor station. Even if this is the "strictest permit ever" which is stated in the documents but not supported by any evidence, this compressor station is for a pipeline that is not needed and will not benefit our state. It will contribute tons of pollutants into our air, soil and water. You must protect the health and safety of the people of Union Hill, justice demands no less. I hope that you will deny the air permit for this compressor station.

Suzanne J. Keller (for myself)
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Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station1 message

Bridget Kelley-Dearing <bridgetzlm@aol.com>

Thu, Sep 20, 2018 at 11:58 PM

To: airdivision1@deq.virginia.gov

Cc: michael.dowd@deq.virginia.gov, patrick.corbett@deq.virginia.gov

1 Health risks from relevant air contaminants receive inadequate treatment.

From studies of compressor stations that "met" NAAQ standards, the following problems were notated: health impacts from hydrogen sulfide, PM2.5 or carbonyls.

Hydrogen sulfide was monitored continuously, documenting the variability of potential exposures, along with the average. Spikes of H2S were quite high. Southwest Pennsylvania Environmental Health Study (SWP-EHP) has similar findings from measurements of PM2.5 near compressor stations. Particulate matter is not included in DEQ concerns, yet must be.

There are other levels and types exposure around compressor stations that raise health concerns. In particular, acetaldehyde, benzene, formaldehyde, carbon tetrachloride, chloroform, 1,2-DCA and 1,1,2-trichloroethane, crotonaldehyde, and 1-methoxy-2-propanone exceeded their respective comparison values (CVs).

Mixtures of pollutants are a critically important topic in addressing the public health implications of compressor stations. In fact, a very large number of chemicals are released together. NAAQ and Medical reference values are not able to take the complex nature of the shale environment, its multiple emissions and interactions into full consideration. Some mixtures like particular matter (PM) and volatile organic compounds (VOC) act synergistically to increase the toxicity of the chemicals.

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Buckingham Compressor Station

1 message

Bridget Kelley-Dearing <bridgetzlm@aol.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 12:00 AM

1Sulphur Oxides and Hazardous Air Pollutants (HAPs) emissions seem to be higher in the 2018 permit application when compared to 2017 estimates. How can Dominion claim best available technology (BACT) if they have selected new equipment that allows increases in these dangerous emissions?

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Fri, Sep 21, 2018 at 12:04 AM

1 Dominion's claim of best available technology seems to involve selective capturing of methane, so how could DEQ assure these levels are lower to protect the citizens of Buckingham County's health and reduce threats from climate change?

Since climate change drilled down is daily and episodic direct impact from methane emitted -- plus all the other pollutants applied to for emission at CS #2, as they are breathed and drunk in water taken from 100% single source individual wells next to the CS #2 site?

Methane is 86% more damaging to protective ozone than carbon dioxide. How does DEQ plan to require Dominion to accurately measure as well as to eliminate the release of methane into the Buckingham County community?

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1 message

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To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 12:14 AM

Insufficient information about direction of air emissions based on actual site conditions, rather than lab testing must be addressed!

Close by residents, and those many miles away, face new sources of large emissions that do have health impacts whether cumulative or by mixture.

The air modeling done in laboratories have not been made clear enough to provide indicators of seasonal or daily peak exposures or minute by minute exposures based on geography.

Many Buckingham County schools are within 10 miles of the compressor station. How will these children be protected?

While baseline emission data from Roanoke, Hopewell, and other parts of the state might provide the best available baselines for air modeling, how can Buckingham County residents be assured of the accuracy of pollution estimates, when the characteristics of these places are clearly different from Buckingham County and DEQ is basing the majority of these pollution estimates on unverified-in-real-life modeling outputs and laboratory testing?

DEQ air modeling for the Buckingham Compressor Station is based on many assumptions about temperature, altitude, and other factors that are not accurate for Buckingham County. Why was field data not collected? How can you assure test results and thus pollution estimates are accurate?

How do you adjust for seasonal variability when assessing impacts of toxic pollutants on human health? For example, how do you take into account the higher exposure level of emissions that occur during the colder months when they stay closer to the ground?

The "emergency" gas turbine, which raises the combined horsepower closer to 57,000 is intended for winter months. How is this accounted for in the air permit? Can Buckingham County residents be assured that use of "emergency" is not being used to "hide" higher levels of emissions in winter?

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9/28/2018

Commonwealth of Virginia Mail - Buckingham Compressor Station

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Buckingham Compressor Station

1 message

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Fri, Sep 21, 2018 at 12:22 AM

1 Atlantic Coast Pipeline compressor stations do not follow industry standard for spacing: Since the recommended distance between compressor stations is usually less than 100 miles, why is the distance between the Atlantic Coast Pipeline compressors so great, particularly since it concentrates dangerous pollution in the Union Hill and Woods Corner neighborhoods?

Given that industry standard is to have compressor stations at shorter intervals, distributing risks and hazards more evenly over transmission distances. How does the Atlantic Coast Pipeline explain that they have only one compressor station per state, and therefore these are very large with a greater impact as needed to provide the pressure to cover 200+ miles between CS #1 and CS #2 and CS #2 and CS #3?

Given Dominion's past actions in other locations, we can anticipate that this compressor station will be expanded in the future. Unless the company can be prohibited from expanding in the future, why is this facility not considered a major source of pollution now so stronger standards are applied?

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Buckingham Compressor Station

1 message

Bridget Kelley-Dearing <bridgetzlm@aol.com>

Fri, Sep 21, 2018 at 12:34 AM

To: airdivision1@deq.virginia.gov

Cc: michael.dowd@deq.virginia.gov, patrick.corbett@deq.virginia.gov

- DEQ did not apply the best available control technology requirement correctly because neither Atlantic Coast Pipeline nor the DEQ ensured that the nitrogen oxide emission limit set in the draft permit achieved the maximum reduction feasible. The currently proposed reduction in nitrogen oxide emissions is 58%, but more significant emissions reductions are achievable and cost effective.
- Limiting nitrogen oxide pollution is essential for human health. According to the EPA, breathing air with a high concentration of nitrogen oxides can cause irritation in the human respiratory system. Nitrogen dioxide—along with other nitrogen oxides—react with chemicals in the air to form particulate matter and ozone. Both of these are also harmful to the human respiratory system.
- Longer-term exposures to elevated concentrations of nitrogen oxides may contribute to the development of asthma and can increase a person's susceptibility to respiratory infections. People with asthma, as well as children and the elderly, are generally at greater risk for these health effects.
- DEQ should require the Atlantic Coast Pipeline to continuously monitor nitrogen oxide emissions from the compressor turbines. This is necessary to ensure the Atlantic Coast Pipeline is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ did not ensure compliance with 9VAC 5-80-1180 because it relied on flawed ambient air quality modeling. The flaws in the modeling include a failure to use the highest allowable emissions rates, failure to account for emissions in very cold conditions when nitrogen oxide rates are expected to increase significantly, and understating emissions during startup and shutdown. Therefore, DEQ did not ensure the compressor station could operate without preventing or interfering with the attainment or maintenance of any applicable ambient air quality standard and without causing or exacerbating a violation of any applicable ambient air quality standard.

- It is important for DEQ to set appropriate, enforceable one-hour limits in the permit. Short-term exposure to high concentrations of nitrogen oxides are especially harmful to people with chronic respiratory conditions. Such exposures over short periods tend to aggravate respiratory diseases, particularly asthma, leading to often severe respiratory symptoms.
- The Atlantic Coast Pipeline has not shown that the amount of toxic pollution emissions from the compressor will not cause or contribute to the endangerment of human health because the Atlantic Coast Pipeline's modeling for formaldehyde and hexane emissions is flawed. Therefore, DEQ cannot, based on the information ACP provided, ensure that the compressor station will not cause, or contribute to, the endangerment of human health. According to the EPA, "formaldehyde can cause irritation of the skin, eyes, nose, and throat. High levels of exposure may cause some types of cancers."
- DEQ should impose an ammonia limit in the permit for the compressor turbines. Currently, no such limit exists.

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Buckingham Compressor Station

1 message

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To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 2:01 AM

Site Suitability for the BCS, must now be the responsibility of the Air Control Board and the Governor for the following reasons:

Environmental Injustice related to VA ACP CS site:

The Environmental Justice Collaborative letter to Gov. Northam, Senators Warner and Kaine, Virginia State Legislators; cc: Federal Energy Regulatory Commissioners, Dominion Resources, and Meryem Karad, Trieste Longwood (DEQ) co-signed by 29 groups describes why the comprehensive assessments must be undertaken immediately:

"Environmental Justice is falling through the cracks because each federal or state agency limits its permitting and regulatory authority to fragmented fields of expertise (air *or* water; air *not* safety or noise pollution).

This approach excludes comprehensive study of the cumulative risks and hazards faced by impacted residents, and supports denial of responsibility for environmental justice implementation. Thus, environmental justice communities remain targets for new burdens of toxic infrastructure in Virginia. Travesties in two of these communities [Union Hill, Buckingham, VA is the only Virginia Atlantic Coast Pipeline compressor station & Chesapeake communities impacted by the Atlantic Coast Pipeline Connector Link] have prompted this letter and our strong recommendations for immediate actions by you" (9-10-18).

Mike Dowd, DEQ, Director, Division of Air and Renewable Energy, at the Buckingham public information meeting held on Aug. 16, 2018 responded to local representatives informing DEQ about the majority African American population of Union Hill, its residents' former slave ancestry, and more, said that in our public comments about the air permit, DEQ will not consider environmental justice or site suitability; that site suitability is left up to the local government.

(28:00) <https://www.facebook.com/photo.php?fbid=10209790593360612&set=a.10209790591240559&type=3>

Yet, it is the responsibility of the Air Pollution Control Board to consider site suitability: "2010 Code of Virginia, Title 10.1 - CONSERVATION. Chapter 13 - Air Pollution Control Board (10.1-1300 thru 10.1-1328) § 10.1-1307. Further powers and duties of Board.

The Board in making regulations and in approving variances, control programs, or permits, and the courts in granting injunctive relief under the provisions of this chapter, shall consider facts and

circumstances relevant to the reasonableness of the activity involved and the regulations proposed to control it, including:

1. The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused
2. The social and economic value of the activity involved
3. The suitability of the activity to the area in which it is located

Unsuitability of Union Hill, Buckingham Virginia as the only Atlantic Coast Pipeline Virginia compressor station site

Dominion has consistently used misinformation about the factual population, race, and omission of historic cultural resources in submissions to Buckingham elected representatives, to FERC and DEQ. Misinformation that erases the name of the community, denser populated numbers of people living in close proximity, majority African American race, and erasure of their Former Slave and Freedmen history (as well as former plantation history) has shaped decision-making at every level of the Atlantic Coast Pipeline's permit processes.

1. Dominion unfairly singled out Buckingham County from all counties along the three state route of the Atlantic Coast Pipeline to claim it has "no historic resources" whether archaeological or architectural in that segment. Yet in all other counties, completely similar resources of early and mid-20th Century and 19th Century homes, churches and their cemeteries, bridges, dilapidated farm structures and stores, etc. were listed and photographed for 1674 pages. Alone, Buckingham's history was/is denied and erased.

In Sept. 18, 2016, the Atlantic Coast Pipeline filed a 1674 page cultural resource application to FERC. For Buckingham County only, the Atlantic Coast Pipeline had "no recorded resources identified within the modified project APE" (Appendix D: 31).

In March 24, 2016, the Atlantic Coast Pipeline filed their Addendum of cultural resources. In Appendix D on P. 31, for Buckingham, Atlantic Coast Pipeline reports only "three [total] resources are "documented within the modified project APE include three single-family dwellings that range in date from circa 1940 to circa 1965 . . . They have no known association with a significant event or person and are not associated with any broad patterns in history." Pp. 330, 331, and 332 are photos of that list of homes/addresses: 330 & 331 are the same home/same photo. 332 is not in Union Hill. L. Fjord identifies 330/331 – the only cultural resources listed for the whole county of Buckingham - as Theo Haskins' on S. James River Highway, an abandoned trailer next to a modular home, without the family cemetery that adjoins it.

That is, Dominion's contractors had to visibly ignore 99 homes on all sides of the CS 2 site, 2 historic black churches and their cemeteries (Union Hill Baptist est 1868; Union Grove Missionary Baptist est. circa 1920); 1 historic white church and cemetery est. 1831, 2 historic black school sites, the 1880s Freedmen home place of the Harper family next to the proposed CS site, no photos of the Variety Shade tobacco barn or of Shelton Store, which is visible from the road in Union Hill.

May 3, 2016, "Union Hill/Woods Corner Rural Historic District" Buckingham, Virginia was listed by Preservation Virginia as a "Most Endangered Historic Place" in Virginia. Notification of that listing and its complex of historic resources, marked and unmarked slave burials, churches, cemeteries, former plantation sites, farm structures, homes, photographs, and slave plantation neighborhood history have been part of public record of comments made to the Buckingham Planning Commission, the Buckingham Board of Supervisors, to FERC, by Dr. Lakshmi Fjord, Justin Sarafin and Sonja Ingram of Preservation Virginia since August 2016.

Dominion knowingly erased the existence of Union Hill as a known community, and its 99 households visibly within 150 foot – 1-mile radius on all sides of their Atlantic Coast Pipeline Virginia compressor station site. In their 2015 FERC application and in all local and state permit processes both written and submitted at public hearings, the Atlantic Coast Pipeline used the 2010 census average person per square mile data for the whole of Buckingham County – 29.6 – to report the population for ACP CS 2.

On May 30, 2018, the spokeswoman for Dominion to the Governor's Advisory Council on Environmental Justice claimed "it is the law" to do so -- when National Environmental Protection Act-NEPA guidelines state the opposite is true:

"The fact that census data can only be disaggregated to certain prescribed levels (e.g., census tracts, census blocks) suggests that pockets of minority or low-income communities, including those that may be experiencing disproportionately high and adverse effects, *may be missed in a traditional census tract-based analysis.*" *Caution is called for in using census data due to the possibility of distortion of population breakdowns ...* In addition to identifying the proportion of the population of individual census tracts that are composed of minority individuals, analysts should attempt to identify whether high concentration "pockets" of minority populations are evidenced in specific geographic areas. ... The IWG guidance also advises agencies not to 'artificially dilute or inflate' the affected minority population" (1997, 15-16).

The Union door-to-door household study of Union Hill designed and conducted by Dr. Lakshmi Fjord (UVA, Dept. of Anthropology) began in August 2016 to uncover the actual 1-mile radius demographic and historic data for the CS 2 site has had 3 stages for a total of 4 months, and ending Sept. 4, 2018. The study follows NIH protocols for health information confidentiality, and community research guidelines. Open-ended interviews of 1-1.5 hours took place in 67 of the 75 households reached. Data includes: factual population, race, ages, pre-existing diagnosed health conditions, family heritage in Union Hill and nearby, and existing economic or food source uses of their land.

The Atlantic Coast Pipeline's Buckingham Compressor Station site map, with a layer of household addresses added by Southern Environmental Law Center based on USPS postal addresses, proves that Dominion always knew and could submit accurately that the compressor station is not "sparsely populated," is not 29.6 people per square mile.

There are many cost benefits to Dominion to erase the population of Union Hill. By contravening NEPA guidelines, FERC in the Atlantic Coast Pipeline's Final Environmental Impact Statement-FEIS reports no environmental justice issues besides low-income for the entire Atlantic Coast Pipeline route, which includes Union Hill-sited CS 2 (FEIS 4.9.9.1 Demographic and Economic Data, Vol 4-512). FERC notes their concerns if there were an African American majority population at this site:

"As discussed in section 4.11.1, air pollutants associated with ACP and SHP include increased dust as a result of construction equipment and vehicles, and compressor station emissions, which include carbon monoxide (CO), carbon dioxide (CO₂), methane, and nitrous oxide (NO_x); volatile organic compounds (VOCs); and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns (PM_{2.5}). These air pollutants are known to increase the effects of asthma³¹ and may increase the risk of lung cancer (Nafstad et al., 2003).

Due to high rates of asthma within the overall African American community, we consider this community especially sensitive" (FEIS Vol 4:512)

Union Hill household data including revised population, race, and existing diagnostic health conditions, is in the public record to Buckingham elected representatives, 2016-17; to FERC in EIS public comments by Dr. Fjord and by Southern Environmental Law Center, 2017; by Dr. Fjord in 401 Water permit comments and NW12 Water Board comments, 2017-18.

Updated household data (Sept. 3, 2018 updates):

- 75 of 99 households reached for a 76.5% response rate, an outstanding rate in social science research.
- 199 weekday residents; with hundreds more on weekends, bimonthly, etc.
- 83% are minorities: African American, Native American/African American, Native American/White, Hispanic, and Asian
- 17% are White
- Children 0-17 are 32%; Elderly are 25%
- For 67 households, we have listed in the table existing diagnosed health conditions that would be impacted by the combination of emissions applied for at the Buckingham Compressor Station, including particulate matter, radon, volatile organic compounds, and list of EPA emissions DEQ lists in their draft air permit for the Atlantic Coast Pipeline.
- Known pre-existing diagnoses at Union Hill, include diabetes, asthma and other lung conditions, chronic bronchitis and pneumonia, heart conditions, breast and other cancers, COPD, lupus, kidney disease, epilepsy, multiple sclerosis, brain tumor, migraines from 35 households in our study who responded to this pre-existing health conditions question.

The Air Pollution Control Board must consider that so far at the local and state level no "site suitability" study and accurate report has been placed in the public record by Dominion for Union Hill Buckingham Compressor Station 2. At every phase of the application process, Dominion has been allowed by Buckingham Board of Supervisors, by FERC, and the DEQ to perpetuate the myth that the Buckingham Compressor Station is a "sparsely populated" place when it serves them:

- i. to compressor stations 200 miles apart, non-industry standard;
- ii. to have shut off valve distances at 15.7 miles apart at this site, which is not Pipeline Hazard and Safety Administration Agency standards for this population size;
- iii. to allow highest PSIS of pressure at this site;
- iv. to locate the intersection of the existing 4-pipeline Transco corridor with the new Atlantic Coast Pipeline in the middle of a huge wetlands;
- v. where 100% of the drinking water is from that shard aquifer, through individual water wells;
- vi. where A1 agricultural zoning was exempted for heavy toxic polluting new industrials complex;
- vii. where there is no industrial use, yet claimed to be so when the Atlantic Coast Pipeline and FERC noted "visibility issues" with this complex;
- viii. where there is scarce internet access, yet the Atlantic Coast Pipeline will build a 125 foot wifi tower and not grant community requests for access to wifi as the only community benefit;

Most egregiously, the Atlantic Coast Pipeline's application, the local Board of Supervisors, and DEQ have all allowed Dominion to:

Erase impacts on a rare and historic Freedmen community still living where their ancestors were enslaved;

Erased that history in its cultural resource report, only filed after Advisory Council on Historic Preservation wrote a rare comment of concern about that complete omission to FERC;

Erases need for closer study of the health impacts on this minority community which FERC, in it's Atlantic Coast Pipeline FEIS, states would be concerned if BCS were a majority African American community. " But, FERC stated it's not, using the Atlantic Coast Pipeline's census data not the expert data submitted by Dr. Fjord and SELC on actual population;

29.6 persons per square mile allow Dominion to have 75% thinner pipes and up to 500% longer shut off valve distances. For the Buckingham Compressor Station, FERC FEIS states valve distances are 15.6 miles apart vs. 2 miles for most populated areas. These benefits to the developer at the expense of impacted residents must not go on.

Site Suitability for the Buckingham Compressor Station must now be the responsibility of the Air Control Board and the Governor.

The local Board of Supervisors accepted the Atlantic Coast Pipeline's flawed and incomplete information for the special use permit. Of 91 comments, 87 were against, 4 in favor; Board voted to approve.

Deliberate erasure of Buckingham Slave history began in 1869 when vigilantes burnt the courthouse to destroy records of enslavement, fearing Buckingham's 2:1 majority former slaves' voting for restitution.

In the Atlantic Coast Pipeline process, African Americans who spoke out against the special use permit have faced reprisals.

DEQ Air and Renewable Energy Director, Mike Dowd, disagreed with FERC's finding that if Union Hill were populous and a minority community it *would matter* to accepting the Atlantic Coast Pipeline's application for Buckingham Compressor Station site. At the Buckingham air permit public info session, Mr. Dowd stated that "population size" doesn't matter because all emissions are below EPA standards in this draft air permit. DEQ staff reported having worked hard to research and insist on technology changes to fix this "only time DEQ failed an air permit by a developer," according to Mr. Dowd.

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Buckingham Compressor Station

1 message

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Fri, Sep 21, 2018 at 2:05 AM

Site Suitability for the BCS, must now be the responsibility of the Air Control Board and the Governor for the following reasons:

Environmental Injustice related to VA ACP CS site:

The Environmental Justice Collaborative letter to Gov. Northam, Senators Warner and Kaine, Virginia State Legislators; cc: Federal Energy Regulatory Commissioners, Dominion Resources, and Meryem Karad, Trieste Longwood (DEQ) co-signed by 29 groups describes why the comprehensive assessments must be undertaken immediately:

"Environmental Justice is falling through the cracks because each federal or state agency limits its permitting and regulatory authority to fragmented fields of expertise (air *or* water; air *not* safety or noise pollution).

This approach excludes comprehensive study of the cumulative risks and hazards faced by impacted residents, and supports denial of responsibility for environmental justice implementation. Thus, environmental justice communities remain targets for new burdens of toxic infrastructure in Virginia. Travesties in two of these communities [Union Hill, Buckingham, VA is the only Virginia Atlantic Coast Pipeline compressor station & Chesapeake communities impacted by the Atlantic Coast Pipeline Connector Link] have prompted this letter and our strong recommendations for immediate actions by you" (9-10-18).

Mike Dowd, DEQ, Director, Division of Air and Renewable Energy, at the Buckingham public information meeting held on Aug. 16, 2018 responded to local representatives informing DEQ about the majority African American population of Union Hill, its residents' former slave ancestry, and more, said that in our public comments about the air permit, DEQ will not consider environmental justice or site suitability; that site suitability is left up to the local government. (28:00) <https://www.facebook.com/photo.php?fbid=10209790593360612&set=a.10209790591240559&type=3>

Yet, it is the responsibility of the Air Pollution Control Board to consider site suitability: "2010 Code of Virginia, Title 10.1 - CONSERVATION. Chapter 13 - Air Pollution Control Board (10.1-1300 thru 10.1-1328) § 10.1-1307. Further powers and duties of Board.

The Board in making regulations and in approving variances, control programs, or permits, and the courts in granting injunctive relief under the provisions of this chapter, shall consider facts and

circumstances relevant to the reasonableness of the activity involved and the regulations proposed to control it, including:

1. The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused
2. The social and economic value of the activity involved
3. The suitability of the activity to the area in which it is located

Unsuitability of Union Hill, Buckingham Virginia as the only Atlantic Coast Pipeline Virginia compressor station site

Dominion has consistently used misinformation about the factual population, race, and omission of historic cultural resources in submissions to Buckingham elected representatives, to FERC and DEQ. Misinformation that erases the name of the community, denser populated numbers of people living in close proximity, majority African American race, and erasure of their Former Slave and Freedmen history (as well as former plantation history) has shaped decision-making at every level of the Atlantic Coast Pipeline's permit processes.

1. Dominion unfairly singled out Buckingham County from all counties along the three state route of the Atlantic Coast Pipeline to claim it has "no historic resources" whether archaeological or architectural in that segment. Yet in all other counties, completely similar resources of early and mid-20th Century and 19th Century homes, churches and their cemeteries, bridges, dilapidated farm structures and stores, etc. were listed and photographed for 1674 pages. Alone, Buckingham's history was/is denied and erased.

In Sept. 18, 2016, the Atlantic Coast Pipeline filed a 1674 page cultural resource application to FERC. For Buckingham County only, the Atlantic Coast Pipeline had "no recorded resources identified within the modified project APE" (Appendix D: 31).

In March 24, 2016, the Atlantic Coast Pipeline filed their Addendum of cultural resources. In Appendix D on P. 31, for Buckingham, Atlantic Coast Pipeline reports only "three [total] resources are "documented within the modified project APE include three single-family dwellings that range in date from circa 1940 to circa 1965 . . . They have no known association with a significant event or person and are not associated with any broad patterns in history." Pp. 330, 331, and 332 are photos of that list of homes/addresses: 330 & 331 are the same home/same photo. 332 is not in Union Hill. L. Fjord identifies 330/331 – the only cultural resources listed for the whole county of Buckingham - as Theo Haskins' on S. James River Highway, an abandoned trailer next to a modular home, without the family cemetery that adjoins it.

That is, Dominion's contractors had to visibly ignore 99 homes on all sides of the CS 2 site, 2 historic black churches and their cemeteries (Union Hill Baptist est 1868; Union Grove Missionary Baptist est. circa 1920); 1 historic white church and cemetery est. 1831, 2 historic black school sites, the 1880s Freedmen home place of the Harper family next to the proposed CS site, no photos of the Variety Shade tobacco barn or of Shelton Store, which is visible from the road in Union Hill.

May 3, 2016, "Union Hill/Woods Corner Rural Historic District" Buckingham, Virginia was listed by Preservation Virginia as a "Most Endangered Historic Place" in Virginia. Notification of that listing and its complex of historic resources, marked and unmarked slave burials, churches, cemeteries, former plantation sites, farm structures, homes, photographs, and slave plantation neighborhood history have been part of public record of comments made to the Buckingham Planning Commission, the Buckingham Board of Supervisors, to FERC, by Dr. Lakshmi Fjord, Justin Sarafin and Sonja Ingram of Preservation Virginia since August 2016.

Dominion knowingly erased the existence of Union Hill as a known community, and its 99 households visibly within 150 foot – 1-mile radius on all sides of their Atlantic Coast Pipeline Virginia compressor station site. In their 2015 FERC application and in all local and state permit processes both written and submitted at public hearings, the Atlantic Coast Pipeline used the 2010 census average person per square mile data for the whole of Buckingham County – 29.6 – to report the population for ACP CS 2.

On May 30, 2018, the spokeswoman for Dominion to the Governor's Advisory Council on Environmental Justice claimed "it is the law" to do so -- when National Environmental Protection Act-NEPA guidelines state the opposite is true:

"The fact that census data can only be disaggregated to certain prescribed levels (e.g., census tracts, census blocks) suggests that pockets of minority or low-income communities, including those that may be experiencing disproportionately high and adverse effects, *may be missed in a traditional census tract-based analysis.*" *Caution is called for in using census data due to the possibility of distortion of population breakdowns ...* In addition to identifying the proportion of the population of individual census tracts that are composed of minority individuals, analysts should attempt to identify whether high concentration "pockets" of minority populations are evidenced in specific geographic areas. ... The IWG guidance also advises agencies not to 'artificially dilute or inflate' the affected minority population" (1997, 15-16).

The Union door-to-door household study of Union Hill designed and conducted by Dr. Lakshmi Fjord (UVA, Dept. of Anthropology) began in August 2016 to uncover the actual 1-mile radius demographic and historic data for the CS 2 site has had 3 stages for a total of 4 months, and ending Sept. 4, 2018. The study follows NIH protocols for health information confidentiality, and community research guidelines. Open-ended interviews of 1-1.5 hours took place in 67 of the 75 households reached. Data includes: factual population, race, ages, pre-existing diagnosed health conditions, family heritage in Union Hill and nearby, and existing economic or food source uses of their land.

The Atlantic Coast Pipeline's Buckingham Compressor Station site map, with a layer of household addresses added by Southern Environmental Law Center based on USPS postal addresses, proves that Dominion always knew and could submit accurately that the compressor station is not "sparsely populated," is not 29.6 people per square mile.

There are many cost benefits to Dominion to erase the population of Union Hill. By contravening NEPA guidelines, FERC in the Atlantic Coast Pipeline's Final Environmental Impact Statement-FEIS reports no environmental justice issues besides low-income for the entire Atlantic Coast Pipeline route, which includes Union Hill-sited CS 2 (FEIS 4.9.9.1 Demographic and Economic Data, Vol 4-512). FERC notes their concerns if there were an African American majority population at this site:

"As discussed in section 4.11.1, air pollutants associated with ACP and SHP include increased dust as a result of construction equipment and vehicles, and compressor station emissions, which include carbon monoxide (CO), carbon dioxide (CO₂), methane, and nitrous oxide (NO_x); volatile organic compounds (VOCs); and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns (PM_{2.5}). These air pollutants are known to increase the effects of asthma³¹ and may increase the risk of lung cancer (Nafstad et al., 2003).

Due to high rates of asthma within the overall African American community, we consider this community especially sensitive" (FEIS Vol 4:512)

Union Hill household data including revised population, race, and existing diagnostic health conditions, is in the public record to Buckingham elected representatives, 2016-17; to FERC in EIS public comments by Dr. Fjord and by Southern Environmental Law Center, 2017; by Dr. Fjord in 401 Water permit comments and NW12 Water Board comments, 2017-18.

Updated household data (Sept. 3, 2018 updates):

- 75 of 99 households reached for a 76.5% response rate, an outstanding rate in social science research.
- 199 weekday residents; with hundreds more on weekends, bimonthly, etc.
- 83% are minorities: African American, Native American/African American, Native American/White, Hispanic, and Asian
- 17% are White
- Children 0-17 are 32%; Elderly are 25%
- For 67 households, we have listed in the table existing diagnosed health conditions that would be impacted by the combination of emissions applied for at the Buckingham Compressor Station, including particulate matter, radon, volatile organic compounds, and list of EPA emissions DEQ lists in their draft air permit for the Atlantic Coast Pipeline.
- Known pre-existing diagnoses at Union Hill, include diabetes, asthma and other lung conditions, chronic bronchitis and pneumonia, heart conditions, breast and other cancers, COPD, lupus, kidney disease, epilepsy, multiple sclerosis, brain tumor, migraines from 35 households in our study who responded to this pre-existing health conditions question.

The Air Pollution Control Board must consider that so far at the local and state level no "site suitability" study and accurate report has been placed in the public record by Dominion for Union Hill Buckingham Compressor Station 2. At every phase of the application process, Dominion has been allowed by Buckingham Board of Supervisors, by FERC, and the DEQ to perpetuate the myth that the Buckingham Compressor Station is a "sparsely populated" place when it serves them:

- i. to compressor stations 200 miles apart, non-industry standard;
- ii. to have shut off valve distances at 15.7 miles apart at this site, which is not Pipeline Hazard and Safety Administration Agency standards for this population size;
- iii. to allow highest PSIS of pressure at this site;
- iv. to locate the intersection of the existing 4-pipeline Transco corridor with the new Atlantic Coast Pipeline in the middle of a huge wetlands;
- v. where 100% of the drinking water is from that shard aquifer, through individual water wells;
- vi. where A1 agricultural zoning was exempted for heavy toxic polluting new industrials complex;
- vii. where there is no industrial use, yet claimed to be so when the Atlantic Coast Pipeline and FERC noted "visibility issues" with this complex;
- viii. where there is scarce internet access, yet the Atlantic Coast Pipeline will build a 125 foot wifi tower and not grant community requests for access to wifi as the only community benefit;

Most egregiously, the Atlantic Coast Pipeline's application, the local Board of Supervisors, and DEQ have all allowed Dominion to:

Erase impacts on a rare and historic Freedmen community still living where their ancestors were enslaved;

Erased that history in its cultural resource report, only filed after Advisory Council on Historic Preservation wrote a rare comment of concern about that complete omission to FERC;

Erases need for closer study of the health impacts on this minority community which FERC, in it's Atlantic Coast Pipeline FEIS, states would be concerned if BCS were a majority African American community. " But, FERC stated it's not, using the Atlantic Coast Pipeline's census data not the expert data submitted by Dr. Fjord and SELC on actual population;

29.6 persons per square mile allow Dominion to have 75% thinner pipes and up to 500% longer shut off valve distances. For the Buckingham Compressor Station, FERC FEIS states valve distances are 15.6 miles apart vs. 2 miles for most populated areas. These benefits to the developer at the expense of impacted residents must not go on.

Site Suitability for the Buckingham Compressor Station must now be the responsibility of the Air Control Board and the Governor.

The local Board of Supervisors accepted the Atlantic Coast Pipeline's flawed and incomplete information for the special use permit. Of 91 comments, 87 were against, 4 in favor; Board voted to approve.

Deliberate erasure of Buckingham Slave history began in 1869 when vigilantes burnt the courthouse to destroy records of enslavement, fearing Buckingham's 2:1 majority former slaves' voting for restitution.

In the Atlantic Coast Pipeline process, African Americans who spoke out against the special use permit have faced reprisals.

DEQ Air and Renewable Energy Director, Mike Dowd, disagreed with FERC's finding that if Union Hill were populous and a minority community it *would matter* to accepting the Atlantic Coast Pipeline's application for Buckingham Compressor Station site. At the Buckingham air permit public info session, Mr. Dowd stated that "population size" doesn't matter because all emissions are below EPA standards in this draft air permit. DEQ staff reported having worked hard to research and insist on technology changes to fix this "only time DEQ failed an air permit by a developer," according to Mr. Dowd.

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Buckingham Compressor Station

1 message

Bridget Kelley-Dearing <bridgetzlm@aol.com>

Fri, Sep 21, 2018 at 2:17 AM

To: airdivision1@deq.virginia.gov

Cc: michael.dowd@deq.virginia.gov, patrick.corbett@deq.virginia.gov, citizenboards@deq.virginia.gov

Critical Unanswered Questions about ACP/Dominion Energy's Union Hill Compressor Station
For four years, we have tried to get state agencies to answer key questions:
here are 106 unanswered questions

PART 1: Technical Questions for the Air Permit and Permitting Process

Emissions

1. How high are the peak hourly emissions for Hazardous Air Pollutants (HAPs) and Volatile Organic Compounds (VOCs) at Buckingham Compressor Station (BCS)? Minor source is based on annual emissions which are an average but peak emissions can really impact health!
2. Emissions during blowdowns occur in large concentrated plumes of methane and co-pollutants. How much of the emissions from the compressor station will remain in the Union Hill and Woods Corner neighborhoods, and how much will travel beyond? With schools are within 10 miles of the compressor station, how will our children be protected?
3. How far away will pollution from BCS extend and in which direction is it most likely to be carried based on wind and other patterns?
4. According to project description on the Virginia Department of Environmental Quality (DEQ) website, the estimated effect on air quality near the facility from the proposed project is that all emissions will comply with all applicable ambient air quality standards. Please share with us the data documenting the current ambient air quality. What is the difference between the ambient air quality now in the air around the proposed project and what is allowable?
5. Sulfur Oxides (SOx) and Hazardous Air Pollutants (HAPs) emissions seem to be higher in the 2018 permit application when compared to 2017 estimates. How can it be best available technology (BACT) if equipment replacement increases these dangerous emissions?
6. Since the recommended distance between compressor stations is usually less than 100 miles, why is the distance between ACP/Dominion Energy compressors so great, particularly since it concentrates dangerous pollution in the Union Hill and Woods Corner neighborhoods?
7. Why does BCS in Virginia have higher emissions than the ACP compressor stations in West Virginia or in North Carolina? Could the spacing of the stations be regularized to not place the greatest risk at Union Hill?
8. Given that industry standard is to have compressor stations at shorter intervals, distributing risks and hazards more evenly over transmission distances. How does ACP/Dominion Energy explain that they have only one compressor station per state, and therefore these are very large and impactful as needed to provide the pressure to cover 200+ miles between stations?
9. Given the fact that ACP/Dominion Energy has not accurately recorded the actual population living next to the BCS site, how will DEQ address the fact that the low population number used (29.4 people per square mile) allows ACP to use up to 75% less heavy pipes and 500% longer shut off valve distances? For air emissions at BCS alone, that means far greater blowdown contents between shut off valves or 15.6 miles apart.
10. Since greater emissions reductions have occurred at other compressor stations, how can the proposed plan for Union Hill be argued to be BACT?
11. Dominion Energy has expanded other compressor stations after permitting and construction. Can we anticipate that this compressor station will be expanded in the future?

12. Unless the company can be prohibited from expanding in the future, why is this facility not considered a major source of pollution now so stronger standards are applied?

13. Known pre-existing diagnoses at Union Hill, include diabetes, asthma and other lung conditions, chronic bronchitis and pneumonia, heart conditions, breast and other cancers, COPD, lupus, kidney disease, epilepsy, multiple sclerosis, brain tumor, migraines and more. Where are the studies to assure that the passage of the Transco pipeline through this portion of Buckingham is not contributing to these medical conditions? Does analysis of BACT take into consideration at-risk populations?

13. Given that particulate matter (PM) causes respiratory damage and there are technologies available to scrub PM from air emissions, how can ACP/Dominion Energy claim BACT if not scrubbing PM?

14. The air permit application and draft air permit do not discuss exact levels of 30+ Hazardous Air Pollutants (HAPS) but do show they will be emitted from BCS. How can we be confident in DEQ protecting our public health if benzene, toluene, etc. and other HAPs known to cause harm to humans are not limited and are tons of HAPs are allowed to be emitted each year?

15. Residents living proximate to compressor stations often report headaches, dizziness, nosebleeds, skin rashes and other concerning symptoms. The DEQ report states that anticipated pollution will not be not harmful to human health because it is within limits, which is also true for other dangerous compressor stations where people are sick. How can you assure us we will not suffer negative health impacts?

16. Could ACP/Dominion Energy increase the amount of gas compressed in the BCS in the future without additional air permitting?

17. While baseline emission data from Roanoke, Hopewell, and other parts of the state might provide the best available baselines for air modeling, how can we be assured of the accuracy of pollution estimates, when the characteristics of these places are clearly different from Buckingham and DEQ is basing the majority of these pollution estimates on unverified-in-real-life modeling outputs and laboratory testing?

18. DEQ air modeling for the BCS is based on many assumptions about temperature, altitude, and other factors that are not accurate for Buckingham. Why was field data not collected? How can you assure test results and thus pollution estimates are accurate?

19. How do you adjust for seasonal variability when assessing impacts of toxic pollutants on human health? For example, how do you take into account the higher exposure level of emissions that occur during the colder months when they stay closer to the ground?

20. The "emergency" gas turbine, which raises the combined horsepower closer to 57,000 is intended for winter months. How is this accounted for in the air permit? Can we be assured that use of "emergency" is not being used to "hide" higher levels of emissions in winter?

21. Please provide an analysis of the long-term effects of the interaction on the human body of all the emissions that will be released constantly and more so during the blowdowns? Many residents are not able to change residences and will be constantly exposed over many years for 24 hours a day every day of our lives.

22. The state measures National Air Ambient Quality Standards (NAAQS) in annual levels, but the blowdown events ACP/Dominion Energy has in their 2018 air permit application release acute emissions over shorter periods. How can nearby residents be assured their health is being protected when state measurements and regulations are not targeted at the specifics of the actual health risk?

23. How many total blowdowns per year, including all compressors, will there be? We never hear the same number twice for the expected number of blowdowns and discussions with other communities with existing compressor stations revealed that blowdowns occur far more frequently than it appears this permit anticipates.

24. What will be the procedure for providing warnings for scheduled blowdowns? Will nearby residents who have health issues be given sufficient time to leave the area until the pollutants are reduced? How long will they have to plan to be away from the area to protect their health? What conditions might affect that time?

25. From the discussion of the BACT analysis in the permit application, it appears that DEQ has relied on the top-down analysis conducted for other (smaller) sites. Shouldn't DEQ have required the applicant to conduct a fresh top-down BACT analysis since BCS is a larger source than the other compressor stations evaluated for BACT?

26. The SOLAR manufacturer for the compressor turbines does not warranty or guaranty emission reductions in real life will approach levels found in modeling tests. SOLAR suggests any estimates must be treated as a range contingent on local variables. Given this careful language and the direct precaution in the SOLAR's sales materials warning against using their estimates in permitting decisions, why has there not been additional independent verification to assure estimates are accurate for Buckingham's local conditions?

27. Since the new technology ACP/Dominion Energy bases their predicted emissions on has never been tested in the field and is taken from manufacturers' laboratory results under

generic conditions, is it not the best practice to hold the air permit application until the new technology has been tested in similar situations? For example, some of the proposed emissions controls have only been used with small turbines dissimilar to those proposed for BCS, isn't additional testing and use required before we can trust the manufacturer's claims?

28. At least one of the SOLAR turbines has demonstrated successful use of catalytic combustion technology. This technology has the potential community benefit of reducing the risks associated with the ammonia injection. Did the BACT analysis consider the use of catalytic combustion technology?

29. Why is it considered appropriate to use Occupational Safety and Health Administration (OSHA) work standards to apply to people exposed in homes? Since most people spend more than 8 hours in their homes each day, how can this be considered a relevant metric to assess home exposure?

30. ACP/Dominion Energy's BACT claim seems to involve selective capturing of methane, so how could DEQ assure these levels are lower to protect our health and reduce threats from climate change? Methane is 86% more damaging to protective ozone than carbon dioxide. How does DEQ plan to require ACP/Dominion Energy to accurately measure as well as to eliminate the release of methane into our community?

31. In the face of a climate change crisis, how can DEQ permit the BCS to release nearly 80 tons of methane per year?

32. Is there the possibility of methane leaking from the BCS or surrounding infrastructure that is unaccounted for in the permit application?

Timing and Format of Permitting Process

33. Why do you not provide more time for public comment since impacted communities do not regularly have internet access when large permit documents are stored as web files? Can you not provide summary tables or other education materials to make content more accessible to impacted communities?

34. Will you extend the comment period for another 30 days beyond September 11 so we have additional time to review documents and prepare comments?

35. Why is the public hearing for this permit being held on the last day of the comment period? This prevents anyone who attends and learns more from making a comment. It also prevents citizens who need time to consider new information from responding after they have time to do this.

36. What is timeline for the public comments to be provided to the Air Pollution Control Board (APCB)? When will the APCB public comments be made available?

Monitoring and Compliance

37. Why do impacted community members have to carry the burden of baseline testing? Will the state compensate residents for the time and money we are investing in baseline testing, since DEQ has not done this necessary work?

38. How can we access data/record-keeping on an ongoing basis to ensure the records that are being kept and so that we can be aware of the accurate quantities of emissions we are being exposed to daily, monthly and yearly?

39. How will we know all of the relevant information is being shared with the public in a timely manner? Polluting companies and state agencies have a checkered history in terms of transparency.

40. Does DEQ plan to establish fence-line monitoring systems to notify local residents when air pollution levels from BCS are unsafe?

41. How monitoring and compliance systems involve impacted community members and use local knowledge to make our system more robust? How can we be assured ACP/Dominion Energy will not be allowed to create a sub-par evacuation process or one that does not fit our rural challenges?

PART 2: Questions Not Covered in the Air Permit Application or Draft Permit**Population**

42. Why did Federal Energy Regulatory Commission (FERC) and DEQ not use the actual numbers of homes and residents of Union Hill in BCS permitting applications?
43. Now that it is public knowledge that there are hundreds of people and former Slave and Freedmen historical sites requiring state protection, how will you rectify your earlier errors?
44. Why is the BCS compressor station with the highest level of toxic air emissions of the three state-based compressor stations located in the middle of the Freedman community of Union Hill? In draft air permit, it cites Union Hill's "above normal ambient air quality" as the reason. Are people paying a price for being good stewards?
45. Union Hill community highly values its nonindustrial character. It is a quiet, suburban level populated, forested area, with clear night skies and ample wildlife. Descendants of people enslaved here have strong cultural ties to land purchased after freedom. Have former slave and Freedmen cultural practices, such as Black church homecomings and family reunions, been factored into health impact assessments of numbers of people directly impacted by BCS air emissions? Especially when all too frequent blowdowns will occur at the BCS site in this neighborhood?
46. Why are two of three ACP compressor stations in predominately African American neighborhoods and all three are in areas with disproportionately high poverty?
47. Dozens of families in the impact area of BSC have daily connection to lands once part of a familial complex of slave plantations. Local Freedman families have evidence of seven generations of continuous habitation in Union Hill. Since the pipeline infrastructure does not actually cross the land owned by many, they will not receive any compensation for their losses. What is being done to ensure that these families' quality of life and safety will allow them to continue to live in the area for generations to come without loss of health or wealth?

Historical Sites

48. Native Americans historical sites and artifacts will be disturbed with the construction of the Atlantic Coast Pipeline and potentially the Buckingham Compressor Station. Since these lands and histories have never been recognized by Virginia due to inadequate state and federal effort to document Native American claims in this area, how will you ensure that important history is protected?
49. FERC and subsequent DEQ consultation practices violated international norms for Free, Prior, and Informed Consent (FPIC) of Native Americans based on the United Nations Declaration on the Rights of Indigenous Peoples. How will adequate consultation with the descendants occur?
50. The only archaeological excavation of Native American sites in Buckingham took place at the James River at Wingina. However, University of Virginia archaeologists noted the large distribution of sites they could not undertake, as well as the hundreds of years of artifacts recorded by amateur collectors. The Advisory Council on Historic Preservation (ACHP) in a letter to FERC called for far more pre-colonial and antebellum archaeological study of Buckingham's sites at the James River and Union Hill before ACP construction. Can you explain how state agencies are confident in the historical records presented by ACP/Dominion Energy when there have never been adequate state ethnographic, anthropological or archeological studies in this area? How will we avoid the near total erasure of both pre-colonial and antebellum histories in a key site of Virginia and U.S. history?
51. To ensure that history is preserved, how will the exact number, location and historical period of each of the dozens of burial grounds and cemeteries in 1.2 mile radius of the compressor station be recorded?
52. A Buckingham County slave burial map was first created in the 1930s under the Works Progress Administration, and Buckingham Historical Society members noted that at least 50 more than the hundreds surveyed are yet to be surveyed. This includes a more than 100+ unmarked slave burial ground on the former Variety Shade Plantation land. We know by red dots on this map that in the 68-acres purchased by ACP/Dominion Energy for the BCS site,

there are numerous slave burial sites. Why have state agencies not required that 68 acres to have a cultural resource report filed?

53. How will the historically segregated African American schools in this part of Buckingham be recognized and protected? Why these have not received state recognition like those in other parts of the Commonwealth?

Liability and compensation for damages

54. Farmers have reported a current gas leak in the existing Transco 4-pipeline corridor in Union Hill. Has Transco reported that leak to state agencies? How often have such leaks on the Transco occurred?

55. Local residents are concerned that Transco paid no liability or damages fines directly to families whose homes were destroyed or damaged by the explosion in Appomattox County next to Buckingham County. What protection will be provided to us if the compressor station causes damage?

56. Buckingham County is a low medical-resource county. There is a clinic with a part-time doctor. Residents have to travel to Charlottesville or to Farmville -- long distances -- by ambulance in emergencies. Everyday healthcare requires driving long distances, at high costs, for this underserved, high poverty populations already. ACP/Dominion Energy denied a request by the Buckingham Planning Commission to set aside a bond to pay for the costs of health impacts from BCS. If the compressor station makes us sick or sicker, how will the state ensure we get the health services we need?

57. Mental health services are inadequate in our rural area. Now, given the additional stress and pressure already expressed by nearby residents about the threat to the health, quality of life, value of their land for themselves and future generations posed by compressor stations, how will we obtain enough social workers and psychologists to provide mental health services to this most vulnerable population? How will the state support those cannot afford these services already and if built, these additional social and monetary costs of ACP/Dominion Energy's new infrastructure constructions and operations here?

58. If community members get sick as a result of toxic emissions from the compressor station like formaldehyde, benzene, and hexane, would they be forced to sign non-disclosure agreements before receiving help with medical bills from ACP/Dominion Energy or Williams Transcontinental (Transco)?

59. We have been told that our home insurance premiums will not increase because we live in the blast zone of the compressor station. We have ample evidence from other communities already proximal to pipelines and compressor stations that homeowners' insurances companies are dropping customers at these sites? What recourse will we have if they do increase or if our insurance carriers drop our coverage?

Risk Assessments

60. Since Quantified Risk Assessment (QRA) is the best available management practice in instances of social vulnerability and risk of exposure, given the high of economic and political marginalization in Buckingham, isn't a QSA called for?

61. If a Comprehensive Health Impact Assessment (CHIA) has not been conducted, how did DEQ assess existing health conditions and numbers of persons in close proximity together with air modeling at BCS?

62. If state agencies have not looked at risks comprehensively, how can DEQ and other agencies assure Buckingham residents that the benefits outweigh the risks? Why not use known medical science to prevent known public health impacts of large compressor stations before issuing ACP/Dominion Energy's BCS air permit for public comment?

63. Why is the intersection of the existing 4-pipeline Transco corridor at BCS not placed at the forefront of the risks and hazards uniquely faced by the people of Union Hill? Given the then quantitative higher risks and hazards of leaks at this site alone?

Energy Poverty

64. The ACP and the BCS, if built, would not create energy access in Union Hill or Buckingham generally. Instead, BCS would contribute air and water pollution raising health costs paid by local residents. How will the state address this inequity?

65. On the basis of poverty alone, what does the state plan to do to address the fact that many in Union Hill and Buckingham live in energy poverty, defined as unable to cover basic utility provision? Union Hill's population is predominantly elderly and the very young, the most vulnerable to high heat and cold conditions. A door-to-door household study around BCS showed residents have pre-existing health conditions but 55% of the population responding could not afford air conditioning. How will the state consider the inequity of highest environmental impact costs per capita of the ACP on a National Environmental Policy Act (NEPA), majority black, impoverished community?

State Water Control Board

66. Will the State Water Control Board consider impacts to the wetland on the site of the BCS? If not, who is responsible?

Economics

67. We did not choose to live in an industrial area and our community is not zoned for such use. However, the Special Use Permit allows this industrial equipment to be placed in our community. How will our property values be protected? How can we be assured that this is not the start of a permanent change in use?

68. Has state agencies considered the dropping values of property in this community? The latest sales involved far lower market values than before ACP's plans for BCS.

69. Economists document that existing pipelines can provide more capacity and will transport gas three to eight times cheaper than can the Atlantic Coast Pipeline. Why are we not using the most cost effective means?

70. The presence of the compressor station in our community will affect current clean and sustainable economic uses of our property. Construction of BCS and daily operations will impact raising cattle and other domestic animals, growing crops, our kitchen gardens, a yoga teaching and retreat center of Yogaville, with a large resident and over 10,000 annual visitors seeking peace and spirituality. Future plans already foreclosed in this neighborhood include a greenhouse business and a small winery. We ask DEQ to consider and weigh in the balance ACP/Dominion Energy's desire for profits for shareholders' benefits not Virginia utility consumers. Do our investments in good quality of life and future economic prosperity have to be sacrificed?

71. How is the state ensuring that our community is not economically damaged by this infrastructure and that it will be economically sustainable in the future?

72. When renewable and alternative energy is sited on property, landowners get monthly lease payments. Instead, properties crossed by pipeline receive a one-time easement payment. How much income could landowners receive if this land was used for solar infrastructure?

Renewable and Alternative Energy

73. How many solar jobs and how much energy could be produced if the money invested in the BSC was invested in solar infrastructure instead?

74. We ask DEQ to support the Union Hill solar projects. What can DEQ do to ensure inequity in energy burdens (i.e., toxic exposure) changes to equity in access to income producing renewable energy?

Baseline Testing

75. We saw that in December of 2016, the Office of Environmental Health & Safety (OEHS) made a clear recommendation to DEQ to do baseline testing of well water and septic fields along the length of the ACP. Why was that not done?

76. Does DEQ know that 100% of drinking water, all water, is from individual wells in almost every part of Buckingham, including Union Hill? Has DEQ assessed the distance of these

wells to underground aquifers where the ACP plans to intersect with the existing 4-pipeline Transco underground in a large wetlands?

77. We also saw that in October of 2017 that VA Department of Health (VDH) recommended to the DEQ to do surveys for both the ACP in karst topography of wells and surface water. Why was that recommendation not accepted and followed through? Geologic reports for the James River where ACP/Dominion Energy plans to horizontal drill underneath the river find "karstic rock features" and a seismic faultline. As this site is very close to the ACP's BCS site and the James River is a major river basin and primary water source, what has DEQ done to assess the hazards and risks of these two interlinking major ACP infrastructure sites?

78. Will DEQ conduct baseline testing of well water, surface water, air, and noise? If so, when? Shouldn't it be done in every season of a year to be most accurate?

Local Emergency Response Capacity

79. Has the facility prepared a Spill Prevention Contingency and Countermeasure plan for the tanks and have they shared the SPCCs with the local emergency planning agencies?

80. What plans have been made for local emergency responses?

81. When will we see evacuation plans?

82. We are worried about the inadequacy of local emergency response services in Buckingham and the highly pressurized, toxic, explosive, and flammable nature of the materials at BCS and in other ACP infrastructure. How will the state assure the safety of local residents?

83. How will ACP/Dominion Energy use local knowledge of limitations in emergency response to make our system more robust? How can we be assured they will not be allowed to set a standardized evacuation process that does not fit our local challenges and characteristics?

84. Many compressor stations start without clear evaluations plans. We know people currently living with compressor stations that have no local emergency plans. FERC does not enforce their provision. What steps can we take if ACP/Dominion Energy's promised evacuation plans are inadequate to assure public safety?

Necessity

85. Are you convinced of the necessity of the ACP when there are existing pipelines that could carry this gas and they were not adequately explored, according to FERC Commissioner Cheryl La Fleur?

Noise

86. We have seen documentation of compressor stations of the same size and same general equipment as BCS generating 90 decibels of noise during blowdowns. How can you assure BCS noise levels will stay below the 55 decibels permitted?

87. Dominion representatives repeatedly tell the press residents will not even notice the noise of the compressor. On what evidence is this based?

88. Please provide us with studies documenting the long term health effects of long-term exposure to permitted noise levels of 55 decibels.

Property Rights and Eminent Domain

89. People in our community have eminent domain court proceedings scheduled for 2019. Can they be assured they will have fair access to all levels of the courts before ACP and BCS construction?

Waste

90. Gas from Marcellus shale has been recorded to contain higher than average amounts of radioactive materials. These radioactive materials and other pollutants end up in the waste from pigging operations done on site at Buckingham. What is the protocol for measuring, storing, and disposing of the toxic waste from the approximately 10 pigging operations per year in the BCS permit?

91. We have been told the BCS construction and ACP construction will require significant water and that the produced water or wastewater containing pollution will be trucked out of Buckingham. Where is the water coming from?

92. Where will waste water from construction activities be taken and dumped?

93. How many water trucks will Buckingham residents need to anticipate on our roads during construction?

94. What are the plans to monitor and control particulate matter pollution from truck construction traffic and other construction activities?

Recordkeeping and Transparency

95. Why are we the last to find out what will happen in our neighborhood? Why do we have to rely on Freedom of Information Act requests to get the real story?

Staffing/Security

96. Given that wi-fi transmission is unreliable in Buckingham, how can Dominion claim use of BACT? Fibre optic cables are the proven best current technology. What can be done to increase security of remote control of BCS from West Virginia?

97. We have received conflicting information about 24/7 staffing of BSC for onsite real-time data collection & monitoring during the life of the compressor station. Will there always be staff on site, even on weekends, holidays, and after the first year?

98. Can the APCB approve the permit when there does not appear to be a Special Use Permit (SUP) for the stacks?

99. How is it possible for DEQ to go forward with compressor station permit hearings with the uncertainty that exists regarding FERC's certificate?

Transco Pipeline

100. Many gas industry reports, and even FERC Commissioner LaFleur, argue the ACP is unnecessary and redundant. If the ACP is canceled due to market shifts or regulatory shortfalls, would the BCS still be built to move the increased gas that is expected with the expansion of the Transco pipeline?

101. Can increases in Transco gas compression in Buckingham move through the compressor without being regulated in an air permit?

102. Would impacted residents be consulted prior to future decisions about increases in gas transportation through the BCS or can DEQ approve increases without community knowledge or input?

Ammonia Tanks

103. The size of the ammonia tanks on the BSC site have increased from 8,000 gallons to more than 13,000 gallons. How does DEQ assure the safe handling of this dangerous material?

104. What relation has this ammonia storage to the Control Board hearings on ammonia set for September 11 & 13?

Electromagnetic Radiation

105. Microwave communication towers impact health due to electromagnetic radiation (EMR). What documentation can you provide us on the effects of exposure on nearby residents from microwave towers like that proposed at BCS?

Uncertainty and Foreboding Fear

106. Every time Buckingham Board of Supervisors has a meeting, do you know we wonder what new pipeline-related surprise we will face? Every low flying helicopter and construction crew invading our quiet neighborhood creates a sense of dread and fear that means our quality of life has already diminished.

Bridget Kelley-Dearing

626 Stonewall Street

Lexington, Virginia 24450

bridgetzlm@aol.com

(540) 463-5113



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

John Kobelski. <John.Kobelski.108989302@p2a.co>

Fri, Sep 21, 2018 at 5:45 PM

Reply-To: jkobel@verizon.net

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
John Kobelski.
[3686 Hill Breeze Rd](#)
[Virginia Beach, VA 23452](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Edward Kosewicz <Edward.Kosewicz.26198275@p2a.co>

Fri, Sep 21, 2018 at 6:28 PM

Reply-To: edward.kosewicz@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Edward Kosewicz
[10425 Jordan Pkwy](#)
[Hopewell, VA 23860](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station Comments

1 message

SLarsen@nsource.com <SLarsen@nsource.com>

Fri, Sep 21, 2018 at 2:47 PM

To: airdivision1@deq.virginia.gov

Please accept the attached comments regarding the Buckingham Compressor Station draft air permit (21599). Thank you for the opportunity to provide comment.

Susan D Larsen, CPA
Director, Business Policy
Columbia Gas of Virginia
[1809 Coyote Drive](#)
[Chester, Virginia 23836](#)
(o) 804.768.6477
(c) 804.461.8119

**Columbia Gas Comments on ACP Buckingham Co draft air permit.pdf**

61K

September 21, 2018

Virginia Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060

RE: Buckingham Compressor Station

Dear Department of Environmental Quality:

I am writing on behalf of Columbia Gas of Virginia ("CVA"), a growing natural gas distribution service provider with more than 265,000 residential, commercial and industrial customers in 98 communities across the Commonwealth. Columbia and its predecessor companies have served in Virginia for more than 160 years. We employ more than 400 Virginians in those same communities. In Virginia, Columbia Gas safely operates more than 5,200 miles of underground gas lines while protecting our air, water and other environmental resources.

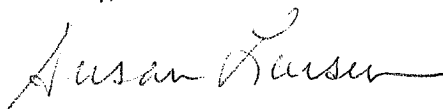
The Buckingham Compressor Station is an integral component of the Atlantic Coast Pipeline, a project which will help relieve capacity constraints in parts of our system, as well as the constraints of other local distribution companies. The Atlantic Coast Pipeline will increase accessibility of domestically produced, economically-priced clean energy for our new customers and reliability for our existing customers. It will also allow CVA to serve a new customer in Buckingham County.

We are encouraged by the developers' commitment to protecting our natural resources and to working with stakeholders to protect the local environment and community. In addition, the Department of Environmental Quality has been thorough and complete in reviewing the Atlantic Coast Pipeline's potential environmental impacts. The 401 certification was only made possible through an objective commitment to science and to protecting our environment. We hope that the outcome of this rigorous process results in the issuance of a draft air permit.

Columbia Gas believes that sound long-term energy policy must include opportunities for all varieties of energy, but that natural gas also must be an integral part of that plan.

We strongly believe that the construction of the Atlantic Coast Pipeline will provide a number of tangible benefits, including increased access to clean energy, jobs, and economic development to the citizens of Virginia and to the customers of Columbia Gas of Virginia. Further, we are convinced that the Atlantic Coast Pipeline can be constructed and operated in a manner that fully protects the Commonwealth's valuable air and other environmental resources.

Sincerely,



Susan D Larsen, Director of Business Policy
Columbia Gas of Virginia
1809 Coyote Drive
Chester, Virginia 23836
(804)768-6477



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Ronald Larson <Ronald.Larson.30721953@p2a.co>

Fri, Sep 21, 2018 at 5:33 PM

Reply-To: ronalar1971@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Ronald Larson
[11 Meadowlark Ln](#)
[Henrico, VA 23228](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Air Pollution

1 message

Ruby Laury <arlee7146@gmail.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 4:25 PM

Oops, forgot to attach letter. So this will be a second email

John & Ruby Laury



Letters to the DEQ & Air Pollution Control Bd Sept 21 2018.docx
20K

September 21, 2018

Air Pollution Control Board
Department of Environmental Quality
Division of Air and Renewable Energy

To whom it may concern:

RE: Atlantic Coast Pipeline, LLC and Buckingham Compressor Station (ACP 2) air permit

My name is Ruby Laury, I am originally from southern California. I moved here 15 years ago with my husband, John W. Laury. After moving here, I understood why he wanted to come back home to Buckingham. Buckingham is a beautiful place, and one of the most **quiet and peaceful**, no pollution—lots of clean air, and plenty of greenery...**Usually No stress, that is, until these past four and a half years.**

I have a great concern for our water. What is going to happen when the underground pipes leak? If this proposed compressor station and pipelines go through, we won't be able to drink the water. **Are they going to supply us with drinking water?** We won't be able to go outside because of the air and noise pollution.

What about our gardens? What about our livestock, domestic animals, and wildlife? They and we all need fresh, clean air. What about our water—water, a most precious commodity?

What about our senior citizens, some who are having health issues, what will happen to them? What about the younger generation whose parents/grandparents plan to leave them an inheritance of their property/homes, etc.? This legacy will be gone. Property values will go down—**will we still be paying the same taxes?**

We live in an agricultural area where we raise crops, cattle, dairy cows, donkeys, goats, and chickens; that is until Dominion/ACP convinced the Board of Supervisors that they wanted a special permit to change the zoning—is this legal? This is still an agricultural area—Not for Dominion—who has said we will be able to receive this natural gas—not true—this gas will have to be fracked, which will emit unsafe gases, and poisons, **polluting this most precious air** that we breathe. **Dominion has not been telling the truth.**

As a resident of Buckingham, Virginia, I am opposed to the proposed Atlantic coast Pipeline & compressor station because of its potential impacts on my community and to our democracy as a whole. I want you to know that many Buckingham landowners are being treated as criminals **on their own property** and are now being threatened in court. A declaration of eminent domain looms on the horizon, the most un-American of practices. Did you know that it was Samuel Adams, who said:

Among the natural rights of the colonists are these: first a right to life, secondly to liberty, and thirdly to property; together with the right to defend them in the best manner they can.

Our agricultural lands will be destroyed in the path of these monsters; and this beautiful scenery that attracts many of my relatives and friends from California to Buckingham is in jeopardy. They come here to relax and get away from the smog in Southern California.

The proposed ACP and Compressor Station just want to come in here and condemn this community, as if we don't exist.

Sometimes the Lord allows things to happen to get me out of my comfort zone—because if this had not happened, I would not have met so many wonderful, beautiful, and caring people from all over the United States.

I don't know if you have seen any of the videos as to what happens when these compressor stations have a blow-down: You'll see children and adults with serious nose bleeds, severe headaches, respiratory problems, polluted water, the extremely loud noise, etc. Fracking emits poisonous gases. If you or your staff would view these videos, you could see first-hand the problems with these proposed pipelines, and compressor stations.

I have a great concern for our water. What is going to happen when the underground pipes leak? If this proposed compressor station and pipelines go through, we won't be able to drink the water. Are they going to supply us with drinking water? We cannot live without water. I am concerned that the ACP will damage our water, that it will leave silt in the water, disrupt underground water systems and leave unprotected soil to just wash away.

What about our heritage, the African-American slave graves, the churches where we worship. The Union Hill Baptist Church was built in the 1800's. I live in Union Hill; our churches are in the Union Hill area. What will happen to them?

As I said, I am retired and spend most of my time in this community; breathing the clean air that is here and using water from our private well. My friends, children, and grandchildren like to visit here – where the Union Hill ancestors owned the land. I did not ask for the ACP to come through our community. I cannot see any way that we will benefit from it. I also am not convinced that either Dominion, the ACP, or the government will protect us and our environment.

What about the effect of noise, the Performance, stress, and behavior of animals. So, my concerns are the effect this noise will have on our cattle (especially the newborn calves) and our donkey. It has been proven that cattle/animals hear high-frequency sounds much better than humans. Can you image the stress, this will have on our cattle on a continual basis? Can you image the trauma this noise will have when the mother cow is trying to give birth? This is why I am so adamant about this proposed pipeline and compressor station. It only is not fair to the animals, but it is also not fair to us humans?

Finally, many studies have shown that hazardous and solid waste facilities, power stations, and industrial plants like the proposed compressor station and ACP are excessively cited in communities of color and low-income neighborhoods. And most importantly, these plants that **emit toxic air and noise pollution** will definitely have a negative effect on the health and well-being of us living in the Union Hill/Woods Road areas.

A review of environmental justice and equity law by the American Bar Association and the Hastings College of Law revealed that poor communities of color **breath some of the least healthy air in the nation**. This study was taken from the South Coast Air Basin in Southern California, where Latinos, African Americans, and the Asian populations in the region face a 50% higher cancer risk than Anglo-Americans in other regions.

Even the United States General Accounting office released finds that three-quarters of the hazardous waste landfill sites in eight southeastern states are located in primarily poor, African-American and/or Latino communities.

The United Church of Christ's Commission for Racial Justice published "Toxic Wastes and Race in the United States" **determined that race** was the most important factor in determining where toxic facilities were located.

We, John and I, want to live out our golden years here in this beautiful serene area; where we can sit outside and breathe in the clean air, and be able to look up in the dark sky at night and see the many beautiful stars that the Lord has put up into the heavens. God put us here to be good stewards of this beautiful land. We are to take care of it—not pollute it!

I will leave you with a quote from Dr. Martin Luther King, Jr.:

*Never, never be afraid to do what's right,
especially if the well-being of a person or
animal is at stake. Society's punishments
are small compared to the wounds we inflict
on our soul when we look the other way.*

And at our sister church, Union Grove Missionary Baptist Church, there's a banner behind the pulpit that reads:

Stand up for what is right even if you are standing alone...

Thank you for taking time out of your busy schedule to read our letter.

Respectfully,

John and Ruby Laury
2037 Union Hill Road
Buckingham VA 23921
Home Phone: 434.390.4725
John's Cell Phone: 434.390.7650
Ruby's Cell Phone: 434.390.4824



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Richard LaVigne <Richard.LaVigne.115247226@p2a.co>

Fri, Sep 21, 2018 at 8:19 PM

Reply-To: richard.lavigne@dominionenergy.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Richard LaVigne
[2404 Buckingham Ave](#)
[Richmond, VA 23228](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Richard LaVigne <Richard.LaVigne.115247226@p2a.co>

Fri, Sep 21, 2018 at 9:25 PM

Reply-To: richard.l.lavigne@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

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Regards,
Richard LaVigne
[2404 Buckingham Ave](#)
[Richmond, VA 23228](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

David Lawrence <David.Lawrence.14949742@p2a.co>

Fri, Sep 21, 2018 at 4:20 PM

Reply-To: dlaw13@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
David Lawrence
[3840 South Ct](#)
[Penn Laird, VA 22846](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station Air Permit

1 message

Leech, Irene <ileech@vt.edu>

Fri, Sep 21, 2018 at 10:24 PM

To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>

Buckingham Compressor Station for the
Atlantic Coast Pipeline
Air Quality Permit

Submission from Irene E. Leech; 4220 North Fork Rd; Elliston, VA 24087. ileech@vt.edu

A number of changes are needed to the proposed air permit.

- It is not sufficient to only make air data available to citizens via FOIA of DEQ. A quick, transparent, and affordable means needs to be provided to the community to monitor what occurs using dependable and defensible data.
- There remains a need for baseline health and environmental studies with results that will stand up to challenges and in sufficient detail to actually address critical issues.
- Further, impact on animals, both wild and domestic, must be documented.

The air permit does not address all pollutants and technical comments submitted identified some of the gaps as well as problems with methodology that will make it difficult to document especially strong but short lived issues.

- It did not apply the best available control technology ("BACT") requirement correctly because neither ACP nor DEQ ensured that the nitrogen oxide emission limit set in the draft permit achieved the maximum reduction feasible. The currently proposed reduction in nitrogen oxide emissions is 58%, but more significant emissions reductions are achievable and cost effective.
- Limiting nitrogen oxide pollution is essential for human health. According to the EPA, breathing air with a high concentration of nitrogen oxides can cause irritation in the human respiratory system. Nitrogen dioxide—along with other nitrogen oxides—react with chemicals in the air to form particulate matter and ozone. Both of these are also harmful to the human respiratory system.
- Longer-term exposures to elevated concentrations of nitrogen oxides may contribute to the development of asthma and can increase a person's susceptibility to respiratory

infections. People with asthma, as well as children and the elderly, are generally at greater risk for these health effects.

- DEQ should require ACP to continuously monitor nitrogen oxide emissions from the compressor turbines. This is necessary to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ did not ensure compliance with 9VAC 5-80-1180 because it relied on flawed ambient air quality modeling. The flaws in the modeling include a failure to use the highest allowable emissions rates, failure to account for emissions in very cold conditions when nitrogen oxide rates are expected to increase significantly, and understating emissions during startup and shutdown. Therefore, DEQ did not ensure the compressor station could operate without preventing or interfering with the attainment or maintenance of any applicable ambient air quality standard and without causing or exacerbating a violation of any applicable ambient air quality standard.
- It is important for DEQ to set appropriate, enforceable one-hour limits in the permit. Short-term exposure to high concentrations of nitrogen oxides are especially harmful to people with chronic respiratory conditions. Such exposures over short periods tend to aggravate respiratory diseases, particularly asthma, leading to often severe respiratory symptoms.
- ACP has not shown that the amount of toxic pollution emissions from the compressor will not cause or contribute to the endangerment of human health because ACP's modeling for formaldehyde and hexane emissions is flawed. Therefore, DEQ cannot, based on the information ACP provided, ensure that the compressor station will not cause, or contribute to, the endangerment of human health. According to the EPA, "formaldehyde can cause irritation of the skin, eyes, nose, and throat. High levels of exposure may cause some types of cancers."
- DEQ should impose an ammonia limit in the permit for the compressor turbines. Currently, no such limit exists.



Buckingham CS air permit 18.docx

15K

Buckingham Compressor Station for the
Atlantic Coast Pipeline
Air Quality Permit

Submission from Irene E. Leech; 4220 North Fork Rd; Elliston, VA 24087. ileech@vt.edu

A number of changes are needed to the proposed air permit.

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infections. People with asthma, as well as children and the elderly, are generally at greater risk for these health effects.

- DEQ should require ACP to continuously monitor nitrogen oxide emissions from the compressor turbines. This is necessary to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.

- DEQ did not ensure compliance with 9VAC 5-80-1180 because it relied on flawed ambient air quality modeling. The flaws in the modeling include a failure to use the highest allowable emissions rates, failure to account for emissions in very cold conditions when nitrogen oxide rates are expected to increase significantly, and understating emissions during startup and shutdown. Therefore, DEQ did not ensure the compressor station could operate without preventing or interfering with the attainment or maintenance of any applicable ambient air quality standard and without causing or exacerbating a violation of any applicable ambient air quality standard.

- It is important for DEQ to set appropriate, enforceable one-hour limits in the permit. Short-term exposure to high concentrations of nitrogen oxides are especially harmful to people with chronic respiratory conditions. Such exposures over short periods tend to aggravate respiratory diseases, particularly asthma, leading to often severe respiratory symptoms.

- ACP has not shown that the amount of toxic pollution emissions from the compressor will not cause or contribute to the endangerment of human health because ACP's modeling for formaldehyde and hexane emissions is flawed. Therefore, DEQ cannot, based on the information ACP provided, ensure that the compressor station will not cause, or contribute to, the endangerment of human health. According to the EPA, "formaldehyde can cause irritation of the skin, eyes, nose, and throat. High levels of exposure may cause some types of cancers."

- DEQ should impose an ammonia limit in the permit for the compressor turbines. Currently, no such limit exists.



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Alan Lepp <Alan.Lepp.79344067@p2a.co>
Reply-To: alan.lepp7@gmail.com
To: Ann Regn <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 4:29 PM

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a "minor" source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to "minor" sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

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Regards,
Alan Lepp
[5351 Devoe Ct](#)
[Woodbridge, VA 22193](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Air Draft Permit comment

1 message

Natalie Linton <lintonnr@mymail.vcu.edu>

Fri, Sep 21, 2018 at 8:21 PM

To: airdivision1@deq.virginia.gov, michael.dowd@deq.virginia.gov, patrick.corbett@deq.virginia.gov

Linton

1821 MacTavish Ave,
Richmond VA 23230



DEQ Air Permit Comment.pdf

47K

Virginia Department of Environmental Quality
Piedmont Regional Office
Buckingham Compressor Station
4949-A Cox Rd
Glen Allen, VA 23060

Natalie Rose Linton
1821 MacTavish Ave, #2103
Richmond, VA 23230
703-350-9526
September 21, 2018

Dear DEQ,

I am writing to express my concern and disturbance with the air draft permit for the Buckingham County Compressor Station. I am presenting an argument for you to deny this air draft permit, in order to further evaluate potential hazards to the environment and the lives and health of Union Hill residents.

To give you some of my own story, I am a 22 year old Student at VCU. I grew up in Loudoun County, with my mother and father's homes eight and three miles from the compressor station there built in 2001. Coincidentally the same year in third grade, I experienced the first of many asthma attacks. The doctors diagnosed it as "seasonal asthma" and I received allergy shots for six years with minimal relief. Until four months ago, my family and I were completely unaware of the 31,000hpr compressor station that might have been the sole cause of my sporadic attacks.

Asthma, and other respiratory issues, increase susceptibility to be hypersensitive to indoor and outdoor air quality. Due to this, I strongly suspect it is the reason as to why I become hyperreactive to a negligent mold issue in a rental home two years ago. I became very sick as a result and took a year off of school to regain some of my health. Due to my redeveloped allergies, solely to fungi, I now have to be continuously conscious of my indoor environment. If there is ever an obvious issue in any building I am in, I leave to go outside.

I cannot imagine what it would be like for it not to be safe inside or outside. Where are the people of Union Hill supposed to go? My understanding is that in other large pipeline projects, Compressor Stations are placed *at most* 60-100 miles apart. Why then is the Buckingham station 261 miles from the station in Lewis County?

At the Air Permit hearing, I heard a lot of Dominion retirees and current Energy Partners praising the draft permit for how it "meets the strictest standards [they] have ever seen!" Aren't these standards "so strict" because it is the largest station ever to be proposed for construction? Due to the size of the station, the emissions, and therefore the local pollutants,

propose the greatest risk on the Union Hill community. Is there a reason why the stations are not placed at more reasonable distances to reduce pollution per area?

I'm sure you are aware of the issue of Environmental Justice from other comments, but I will shortly reiterate. Union Hill and Northampton are predominately African American low income communities. Upon research I found that the proposed location in Lewis County is predominately Hispanic and Asian. Why are these *really* the compressor station locations for the ACP? Why are these communities *chosen* to be exposed to suffer the negative health impacts of un-analyzed emissions in their air? I believe the logical response is to, at the very least, conduct a long-term health analysis using animals, not humans, to study the effects of constant exposure to the emissions. The human beings of Union Hill do not exist to be lab rats for Dominions claimed "new technology," generated and tested only through a computer program. Dominions "new technology" proposed in the air permit is not field tested and therefore it is unethical and careless to put the environment and the people of Union Hill at risk of potential life-threatening hazards.

Further, the residents of Union Hill should be allowed full-access to Dominion's records and monitoring systems listed in the Air Draft Permit. This process has been mostly out of their control, and they have had to conduct their own baseline testing of their water, outdoor and indoor air quality. If passed, the Buckingham Compressor Station will present possible life-threatening hazards for the residents of Union Hill. Therefore, each resident should be able to access when blowdowns will occur, and what pollutants at what levels exist in their air on a minute to minute basis. Most residents of Union Hill will not be able to afford to move if this is built, and deserve to have access to the information that can make a difference for their health management.

The residents of Union Hill did not choose to live amongst this proposed Compressor Station, and their community was not zoned for such a use. Their property values will plummet as a result, which is what The Atlantic Coast Pipeline, LLC, has predicted from the very beginning. I found a PowerPoint by Dominion from 2016 that states that the Compressor Station, "will not encourage new residential development [in Union Hill's] low population density." Where are those promised jobs if there is not a growing community to perform those jobs?

The narrative of the ACP shifts and shapes depending upon it's audience- what narrative does it tell you?

Respectfully,

Natalie Linton



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Barbara Lizana <Barbara.Lizana.112633211@p2a.co>

Fri, Sep 21, 2018 at 4:30 PM

Reply-To: barjacbar@yahoo.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Barbara Lizana
[1341 Eagle Ave](#)
[Virginia Beach, VA 23453](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Wilson Madison <Wilson.Madison.115697155@p2a.co>

Fri, Sep 21, 2018 at 10:23 PM

Reply-To: wilson.madison1@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Wilson Madison
[369 Meador Rd](#)
[Cumberland, VA 23040](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Gordon Martin <Gordon.Martin.108977972@p2a.co>
Reply-To: gordon.peter.martin@dominionenergy.com
To: Ann Regn <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 4:19 PM

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Gordon Martin
[12538 Erroll Ln](#)
[Bristow, VA 20136](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Dennis Martire <Dennis.Martire.116299363@p2a.co>

Fri, Sep 21, 2018 at 5:46 PM

Reply-To: dmartire@maliuna.org

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Dennis Martire
[19015 Rocky Creek Dr](#)
[Leesburg, VA 20176](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station Air Permit

1 message

Bridget McGregor (mcgregba@dukes.jmu.edu) Sent You a Personal Message

Fri, Sep 21, 2018 at 3:11

<automail@knowwho.com>

PM

To: airdivision1@deq.virginia.gov

Dear Ann Regn,

I am writing to request that you deny the Stationary Source Permit to Construct and Operate Dominion Energy's proposed Buckingham fracked-gas compressor station as it is inadequate to protect the air quality and public health of Virginians. The permit is particularly inadequate to protect the Virginians in the Union Hill and overall Buckingham County communities that will be most directly impacted by the compressor station's operation.

A compressor station of this scale is unprecedented in Virginia. The proposed compressor station would be the largest in Virginia's history. Despite this, the draft permit does not contain sufficient analysis of impacts on the community and how impacts will be mitigated. The draft permit does not sufficiently explain how the compressor station will impact the community or why the standards and methodologies it relies on to analyze impacts are enough to protect human health.

- In the analysis of the draft permit, the Virginia Department of Environmental Quality states, based on a 2017 evaluation, that the proposed site for the compressor station is "sparsely populated". However, research done by community groups indicates that this is absolutely not true and that there are hundreds of Virginians living close to the site.

- Some residents live as close as half a mile from the proposed compressor station site. Evidence shows people living near compressor stations have suffered from symptoms ranging from rashes to gastrointestinal, respiratory, neurological and psychological problems. The draft permit does not explain how the air quality and health of these especially vulnerable residents will be protected over time from harmful air emissions.

- The draft permit will require mostly self-monitoring by Dominion of air quality and emissions. It does not explain why installing further community monitoring technology is unnecessary to protect air quality and human health.

- A Quantitative Risk Assessment and Comprehensive Health Impact Assessment should be conducted to address the complex and multifaceted ways that the health of residents could be impacted by emissions from the compressor station.

- No mention of how air quality emergencies will impact the community or be mitigated is included in the draft permit.

- While greenhouse gas emissions are briefly mentioned, there is no analysis of how measures established in the draft permit will ensure that air quality and human health will be protected from climate change impacts.

Virginians rely on the expertise of public officials like those on the Air Board to ensure their health and environment is protected. It is imperative that the deficiencies noted above are addressed so that the comprehensive impacts on air quality and the health of Virginians can be adequately considered and addressed before a permit is issued.

For these reasons, I respectfully request that the Air Board deny Dominion's permit for the Buckingham Compressor Station.

Sincerely,

Bridget McGregor
1000 Littlepage Street
Fredericksburg, VA 22401
mcgregba@dukes.jmu.edu
(540) 288-6685

This message was sent by KnowWho, as a service provider only, on behalf of the individual noted in the sender information.



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP is safe and necessary

1 message

Paul Meko <Paul.Meko.107730796@p2a.co>
Reply-To: paul_dom@hotmail.com
To: Ann Regn <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 4:21 PM

Dear Director Ann Regn,

Doing the right thing for our communities, our economy, and our environment is a balancing act. That's why a project as important as the Atlantic Coast Pipeline isn't built overnight. Rather, this project has gone through more than three years of careful planning and thorough scrutiny from agencies and organizations at every level.

Because of that exhaustive planning, the ACP is the safest way for us to get affordable, cleaner natural gas to those in our region who desperately need it.

The Buckingham Compressor Station is an integral part of the ACP project. The compressor station's "best in class" engineering design, and advanced emissions control equipment will ensure the facility will fully protect Virginia's air quality. In fact, modeling has demonstrated that the station's emissions, even when the facility is operating at its maximum, will not adversely impact Virginia's air quality. The modeling was conducted using methods approved by DEQ and has proven reliable thus far.

I believe that the stringency of the air quality permit that the ACP project has already passed will keep our community safe—while still allowing us to move forward with producing cleaner and more affordable American energy.

Accordingly, in the case of the recent discussions by the State Water Control Board regarding the state's use of the Army Corps of Engineers Nationwide Permit 12, I believe revisiting the existing process would be a mistake.

Our state's environment and our business climate have prospered from a consistent, predictable regulatory climate and from federal and state partnerships to allow scarce regulatory resources to be put to optimal use. There is no need to change the current approach.

Sincerely,
Paul Meko
[129 Palace Green Blvd](#)
[Virginia Beach, VA 23452](#)

--

Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Paul Meko <Paul.Meko.107730796@p2a.co>
Reply-To: paul_dom@hotmail.com
To: Ann Regn <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 4:20 PM

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Paul Meko
[129 Palace Green Blvd](#)
[Virginia Beach, VA 23452](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP is safe and necessary

1 message

Paul Meko <Paul.Meko.107730796@p2a.co>

Fri, Sep 21, 2018 at 4:22 PM

Reply-To: paul_dom@hotmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

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Sincerely,
Paul Meko
[129 Palace Green Blvd](#)
[Virginia Beach, VA 23452](#)

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Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Jeff Mock <Jeff.Mock.107627421@p2a.co>
Reply-To: jeffrey.g.mock@dominionenergy.com
To: Ann Regn <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 4:20 PM

Dear Director Ann Regn,

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Regards,
Jeff Mock
[17254 Library Blvd](#)
[Ruther Glen, VA 22546](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Carolyn Morrison <Carolyn.Morrison.107621364@p2a.co>

Fri, Sep 21, 2018 at 4:20 PM

Reply-To: c.morr@icloud.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

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Regards,
Carolyn Morrison
[519 Coalbrook Dr](#)
[Midlothian, VA 23114](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Proposed pipeline should be stopped

1 message

A. W. Morriss <whitandjane@gmail.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 10:39 PM

According to a 2017 [report](#) by Physicians for Social Responsibility, "Air samples collected around compressor stations have shown elevated concentrations of many of the dangerous substances associated with fracked gas, including volatile organic compounds, particulate matter and gaseous radon, among others."

The report links those pollutants to a range of health effects for nearby residents, including skin rashes and respiratory, neurological, and gastrointestinal problems.

"Compressor stations are the most polluting part of pipeline infrastructure," said SELC Senior Attorney David Neal.

Is it the duty of the air division of the DEQ to protect the air quality of Virginians? Would you want this air compressor station (or this pipeline) in your community? Are you aware that the purpose of this whole pipeline plan is to supply money to stockholders of Duke Power and Dominion Resources, not to supply energy to customers? Thank you for your service, Jane Morriss



Air Division 1, rr <airdivision1@deq.virginia.gov>

Comments on proposed air permit for the Atlantic Coast Pipeline Buckingham Compressor Station No. 21599

1 message

Jon Mueller ext. 2162 <jmueller@cbf.org>

Fri, Sep 21, 2018 at 7:10 PM

To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>

Cc: Amanda Van Houten <AVanHouten@cbf.org>, Rebecca Tomazin <RTomazin@cbf.org>, Peggy Sanner <PSanner@cbf.org>, Ariel Solaski <ASolaski@cbf.org>, Kenny Fletcher <KFletcher@cbf.org>

To the Virginia State Air Pollution Control Board and DEQ:

Attached are the comments of the Chesapeake Bay Foundation with respect to the proposed air permit for the Buckingham Compressor Station.

Please advise receipt of these comments and Exhibits A – G.

Sincerely,

Jon A. Mueller

Vice President for Litigation

Chesapeake Bay Foundation, Inc.

6 Herndon Ave.

Annapolis, MD 21401

[Jmueller@cbf.org](mailto:jmueller@cbf.org)

(443) 482-2162

www.cbf.org



8 attachments

Exhibit A - Sahu Comments on the Atlantic Coast Pipeline Buckingham Compressor Station (Sept 21 2018).pdf
548K



Exhibit B - Homes.pdf
1962K



Exhibit C - Natural Gas Pipelines in VA.pdf
2505K



Exhibit D -Andy Gray's Total Annual Nitrogen Deposition.pdf
232K



Exhibit E - Thurston Buckingham Declaration 9-11-18.pdf
855K



Exhibit F - Location-Map.pdf
1976K



Exhibit G - Station-Drone.pdf
2742K



Comment Letter to Air Board Buckingham - Final.pdf
496K

**Comments on the Virginia Department of Environmental Quality (VDEQ) Draft
Stationary Source Permit to Atlantic Coast Pipeline, LLC to Construct and Operate
a Natural Gas Compressor Station (Registration Number: 21599)
located at 5297 S James River Hwy, Wingina, VA 24599**

By Ranajit Sahu¹ on behalf of the Chesapeake Bay Foundation, Inc.

I provide the following comments on the air pollution permit sought for the compressor station to be built in Buckingham County, Virginia, for the Atlantic Coast Pipeline (ACP). While I appreciate the many questions asked by the Virginia Department of Environmental Quality (DEQ) during the review of the application and supporting materials, nonetheless deficiencies in the proposed permit are significant and numerous. As such, I recommend that the Virginia Air Board and the DEQ either deny the permit or reissue a revised permit for additional public comment before taking final action.

The compressor station facility mainly consists of four compressor turbines of various sizes. Their basic purpose is to provide additional pressure to the natural gas being transported in the pipeline so that the gas can travel further down the pipeline to points downstream. Since any fluid, like natural gas, loses pressure due to friction as it is transported in a pipe, the compressor station basically provides a “boost” to the gas in order that it may travel farther. Providing this boost, however, requires running the compressors, which means burning some of the gas being transported. Combustion of this gas will result in the production (and emission) of a range of air pollutants including criteria pollutants such as NO_x, CO, SO₂, PM (various sizes), etc. as well as air toxics (benzene, formaldehyde, hexane, polycyclic aromatic hydrocarbons, etc.) and greenhouse gases (CO₂, unburnt methane, N₂O, etc.). Additional combustion emissions will be emitted from an emergency engine located onsite. In addition, the compressor station will also emit non-combustion pollutants, such as fugitive emissions of the natural gas itself from leaks (from various valves, pumps, flanges, gaskets, etc.) as well as from maintenance activities such as pipeline cleaning (“pigging”) and other, periodic actions such as testing for safety, etc. when

¹ Resume provided in Attachment A.

natural gas will be vented periodically. Still other non-combustion emissions include fugitive hydrocarbons from tanks, etc. All of these emissions will be emitted into the ambient air in the vicinity of the compressor station where they will not only impact the immediate vicinity and residents but also be transported over longer distances, creating additional air pollutants, which will impact even distant locations and globally. Local impacts include incrementally greater health risks due to the emissions of numerous toxic air contaminants, some of which will be present in the gas itself and others generated during combustion of the gas in the turbines. Longer range impacts include the emissions of pollutants such as NO_x and hydrocarbons, which are not only pollutants in their own right but are also precursors of pollutants formed in the atmosphere such as ozone. NO_x and SO₂ are precursors of fine particulate matter (secondary PM_{2.5}). Finally, greenhouse gases which affect the global climate (which, in turn, will affect local conditions in Virginia) such as methane in the natural gas as well as combustion products such as carbon dioxide will also be emitted by the proposed compressor station.

1. The Need for a Station of this Size, or its Particular Location are Not Supported by the Record

Neither the permit application materials nor the draft permit or DEQ's analysis/ rationale for issuing the permit include any discussion of the overall size of the proposed compressor station or the choice of the four different Solar turbines (CT-01 is a Solar Mars turbine; CT-02 is a Solar Taurus turbine; CT-03 is a Solar Titan turbine; and CT-04 is a Solar Centaur turbine)² that will comprise the heart of the station. Collectively, these four compressor turbines will have a rating of approximately 54,000 hp.³

Since environmental impacts, including air emissions, depend directly on the size of the station, the public needs to be provided analysis and support for the need for 54,000 hp of compression capability. For example, it is not clear whether the proposed size of the station is actually needed for the gas flows expected to be transported by the current Atlantic Coast Pipeline, or to support some future expanded version of the pipeline or to support some other altogether different future

² Draft Permit, p. 5.

³ Draft Permit, p. 5.

pipeline. The applicant and DEQ should provide the requisite background information on the size of the station and why this size is appropriate.

Curiously, even basic facts such as the level of compression in the pipeline, which affects the size of the station, are not consistent in the record. For example, in the Final Environmental Impact Statement (FEIS) for the pipeline, the line pressure is noted as 1440 psig⁴ or approximately 1454.7 psia. Yet, as I will note later, the emissions calculations supporting the permit have used, variously 1400 or, finally 1200 psig. Both the FEIS and the permit calculations cannot be correct. If, in fact, the permit calculations, which use the 1200 psig value, are correct, that means that the “Final” EIS is wrong. Since the line pressure dictates the size of the compressor stations, including the Buckingham station as well as the two others supporting the pipeline, perhaps all of them are oversized if they now have to support a line pressure of 1200 and not 1440 psig. I ask the DEQ to clarify.

Additionally, the permit does not discuss why the station has to be situated where it is proposed and not at a different location. As it is proposed, it is right on the Transco line, which suggests that there may be plans by the station owner to facilitate transport of additional gas on that line to undisclosed locations. Given that the proposed station will also create significant noise and lighting impacts, in addition to the air pollutants that it will emit, such impacts could be reduced or minimized (along with avoiding clear-cutting trees) if the station were to be moved to a different location, such as the Midland site, only a few miles away from the current site – i.e., to an already-vacant area away from homes. It is my understanding that the DEQ has statutory authority to go beyond just the air permitting issues to look at and address broader environmental impacts from the proposed station.

2. All of the Application Materials and Clarifications Submitted by the Applicant Should be Part of the Permit and Therefore Enforceable

⁴ “The AP-1 mainline would originate at the terminus of the TL-635 loopline in Harrison County, West Virginia and extend to the southeast through Virginia to its terminus near the border of Virginia and North Carolina in Northampton County, North Carolina and the proposed location of Compressor Station 3. The AP-1 mainline would transport up to 1.5 Bcf/d of natural gas to multiple delivery points along its route. The proposed maximum allowable operating pressure (MAOP)² of the AP-1 mainline is 1,440 pounds per square inch gauge (psig).” FEIS, Volume 1, p. 2-5.

It is evident from a review of: (i) the application materials submitted by the applicant; (ii) additional analyses such as the dispersion modeling conducted by the applicant; and (iii) responses by the applicant to questions raised by DEQ – that these contain numerous assumptions that affect the emissions calculations as well as the results of the dispersion modeling – which have been relied upon to conclude that air pollutant emissions from this proposed facility will not significantly impact anything – locally, regionally, or globally. Yet, unless these numerous assumptions are made enforceable, along with appropriate recordkeeping and reporting requirements, as applicable – none of the conclusions that are asserted relying on these assumptions mean anything.

I will discuss specific assumptions made in support of analyses such as the impacts of toxic air contaminants like formaldehyde and hexane, etc. later in these comments. However, it is clear that ALL such assumptions (and not just those affecting a few pollutants) need to be made enforceable. This is a glaring deficiency in the draft permit and its resolution will likely require that a revised draft permit be made available for public comment before it is ready for review by the Air Board.

3. The Equipment Sizes Stated in the Permit Are Not Enforceable and Should be Enforceable

As but one example of the point made in the prior section, without any technical or legal justification whatsoever, the draft permit simply states that the “[S]pecifications included in the above tables [on page 5 of the Draft permit] are for informational purposes only and do not form enforceable terms or conditions of the permit.”⁵ Such an open-ended description of the compressor station’s specifications is unacceptable. Emissions from compressor turbines are directly a function of the size of the turbines. Thus, the size of the equipment is a very critical aspect of the potential and actual emissions from that equipment. It makes no sense therefore to not require that the size (as well as make and model) of the equipment shown in the table on page 5 of the draft permit as an enforceable term. If the DEQ intends to leave the important characteristics of the

⁵ Draft Permit, p. 6.

various equipment that comprise the proposed compressor station as unenforceable, it should provide a thorough justification as opposed to a single, conclusionary sentence.

4. The Applicant and the DEQ Cannot Rely on Manufacturer's Emissions Data Supporting the Permit

The entire edifice upon which the draft permit rests, is the critical analyses undertaken in the dispersion modeling conducted by the applicant,⁶ which in turn relies, importantly, on emissions calculations and estimates.⁷ In many cases, the applicant points to the turbine manufacturer (Solar) as the source of the emissions data and assumptions. For example, in the Appendix C emissions calculations as part of the updated modeling report submitted on July 10, the applicant refers to manufacturer's data at Note 2 to Table C-2; Note 4 to the first table shown as Table C-4 and as Note 3 to other tables on the same page; Note 1 and Note 3 regarding the emission factor for formaldehyde to Table C-6; various attributions, including Note 4 to Solar on the page marked Table C-11; and several pages of Solar data following Table C-11 at the end of Appendix C. The support for and accuracy of the manufacture's data is unknown.

Confusingly, in addition to the emissions calculations shown in Appendix C, there appear to be identical emissions calculations tables after the last of the contours shown in Appendix H.

The emissions calculations refer to a couple of Solar Product Information Letters (PIL). I first address formaldehyde because of its critical impacts as a toxic air contaminant on the immediate community which I discuss later. PIL-168 dated May 2012 was the source of the formaldehyde emission factor used in the emissions and modeling analysis per Note 1 to Table C-6. PIL-168 was submitted to the DEQ by the applicant as part of the August 7, 2017 revised application. In PIL-168, at Table 1, which is the source of the emission factor for formaldehyde, it is clear that Solar is relying on a 2003 EPA document and that the emission factor is not maximum but a 95th

⁶ Updated Air Quality Modeling Report, submitted July 10, 2018 to the DEQ.

⁷ Appendix C to the July 10, 2018 Updated Air Quality Modeling Report. This version of the emissions calculations appears to be the most recent of all of the emissions calculations in the record. Therefore, my comments on the emissions calculations, unless explicitly noted as referencing any other prior version, all refer to this, July 10, 2018 version of the emissions calculations.

percentile value. Importantly, PIL-168 makes it clear that the formaldehyde emissions from any of the turbines will depend on many variables such as: ambient temperature; humidity; atmospheric pressure; fuel quality; test method measurement variability; and additional unspecified operational factors. Therefore it is not surprising when Solar clearly states in PIL-168 that “Solar does not typically warranty the emission rates for VOC, SO₂ or formaldehyde.” I could not find any express warranties by Solar with regards to these pollutant emission factors in the record.

Next, with regards to emissions of pollutants, during startup, shutdown, and commissioning,⁸ the application relies on Solar PIL-170, an updated February 2018 version of which was submitted to the DEQ as Attachment 4 to the June 29, 2018 comment responses to the DEQ. However, this PIL-170 makes it explicit that Solar simply does not stand behind any of the emission factors provided in the PIL. At the beginning of this PIL, Solar could not be more clear:

“...Emissions estimates related to the start-up, shutdown, and commissioning of combustion turbines will not be warranted. The estimates in this document are based on limited engine testing and analysis. The engine testing was conducted at idle and other *non-SoLoNO_x* mode load points. An actual SU/SD event was not measured...The estimates are most commonly used for potential to emit calculations to determine air permitting status. Solar discourages customers from accepting the estimates as start-up and shutdown event permit limits with or without source testing requirements. Accurately measuring emissions during a - non-steady state - start-up or shutdown event with steady state source test methods may prove to be very challenging. In the event customers take permit limits and accept compliance testing permit conditions, Solar recommends adding significant margin to the estimates in this document.”⁹ (emphasis added)

Focusing on the last, no additional “significant margin” appears to have been included, as required by Solar, in any of the emissions calculations and dispersion modeling analyses presented by the applicant.

⁸ I note that I could not find any emissions calculations of modeling associated with commissioning of the turbines at the proposed station.

⁹ Solar PIL-170, February 2018, Attachment 4 to June 29, 2018 submittal to the DEQ by the applicant.

Further, on every single table in PIL-170, Solar explicitly states at the top: “Data will NOT be warranted under any circumstances” (emphasis in original).

Plainly, based on the discussion above, to assume that Solar warranties the emissions data, could not be more wrong. Thus, since the applicant made no adjustments to the Solar data and simply used the unadjusted emissions calculations in its dispersion modeling, the conclusions of the modeling are fatally deficient and will under-predict impacts from the proposed facility. Moreover, permit terms that rely on manufacturer’s data or warranties are legally deficient. The DEQ should rectify these fundamental defects in the permit and reissue a revised draft for public comment.

5. The Permit is Improperly Rife with Unenforceable Language in Numerous Permit Conditions

The proposed permit contains at least four instances of vague, undefined, and unenforceable permit terms that must be amended before the permit should be considered for approval.

First, page 6 of the draft permit, paragraph 1, states: “[W]hen a compressor turbine’s inlet air temperature is less than 0°F, the SoLoNOx technology¹⁰ must be operated to maximum extent possible, following the manufacturer’s written protocol or best engineering practices for minimizing emissions.”¹¹ (emphasis added). Nothing in this statement makes it enforceable. The permit does not define what it means by “maximum extent possible,” or “best practices for minimizing emissions. The “manufacturer’s written protocol” developed for this proposed facility is not provided in the record. Thus, neither DEQ, this Board, nor the public have any information to determine whether compliance with this manufacturer’s recommendation is critical to protecting air quality and human health. To the extent that the manufacturer’s literature is provided with the permit application, it is generic in nature and it disclaims all responsibility for any emissions or performance guarantees, as noted later.

¹⁰ SoLoNOx is proprietary NO_x reduction technology of the turbine manufacturer, Solar Turbines.

¹¹ Draft Permit, p. 6.

Unsupported statements are meaningless. By law, the Board and DEQ must create an enforceable permit so that actual performance of the facility, once constructed and in operation, can be properly evaluated against measurable permit terms. Loose “recommendations” and unenforceable language in the draft permit must be replaced by defined, enforceable, conditions.

Second, paragraph 4 on page 6 of the draft permit states: “[T]he permittee shall operate and maintain each compressor turbine, all air pollution control equipment, and all monitoring equipment in a manner consistent with good air pollution control practices for minimizing emissions at all times, including during start-up, shutdown, and malfunction.” (emphasis added). Again, none of the emphasized text is enforceable. The phrase “good air pollution control practices for minimizing emissions” is undefined. Thus, it is not subject to monitoring or review when the plant is operating and is a meaningless permit term. Each term of the permit must be well defined and subject to reliable monitoring. Accordingly, the permit must clearly define what “good air pollution practices” means and how compliance with that term will be determined.

Third, paragraph 4(e) on page 7 of the draft permit states: “During start-up and shutdown, the compressor turbine SCR system (including ammonia injection) and oxidation catalyst system shall be operated in a manner to minimize emissions following the manufacturer's written protocol or best engineering practices for minimizing emissions. Written documentation shall be maintained explaining the sufficiency of the practices. If such practices are used in lieu of the manufacturer's protocol, the documentation shall justify why the practices are at least equivalent to manufacturer's protocols with respect to minimizing emissions.” (emphasis added). Since there is no size-specific manufacturer's protocol, this entire condition is unenforceable. Moreover, terms such as “operated in a manner to minimize emissions” and “best practices for minimizing emissions” are capable of such broad interpretation they are meaningless as enforceable permit terms subject to monitoring and compliance assurance. Thus, such terms will not result in any actual emissions minimization or assurance to the Board, DEQ or the public that the compressor station will be operated in a manner most protective of air quality and human health.

Finally, paragraph 6(e) on page 8 of the draft permit states: “[T]he permittee shall install a vent gas reduction system (VGRS¹²) to ensure the sufficient differential pressure required in Condition

6.d is maintained. The VGRS shall be provided with adequate access for inspection and shall be in operation as necessary to ensure sufficient differential pressure between the seal gas and compressor turbine case such that the dry seal is maintained for the respective compressor turbine in compliance with Condition 6.g.” (emphasis added). The permit should provide a numerical value for what is “sufficient differential pressure” for each seal/turbine. Without a numerical value, the Board, DEQ, and the public can have no assurance that the station will be operated in a manner most protective of air quality and human health.

6. The Definition of Start-up (and Shutdown) Is too Broad and Should be Narrowed

The permit allows various pollution controls to not run during periods of start-up and shutdown. See, for example, paragraphs 1¹³ and 2¹⁴ on page 6 of the draft permit. Effectively, the operator is excused from using, for each of the four turbines, the NO_x controls (SoLoNO_x or SCR) during start-up and shutdown or the CO/VOC control (oxidation catalyst) during start-up.

It should follow logically, given these broad exemptions from operating the controls during start-up and shutdown, that the definition of what constitutes the start-up and shutdown periods would be carefully constrained and minimized for each turbine. Yet, the permit does no such thing. Rather, it contains the following definitions of start-up and shutdown:

“4(a). For the purpose of this permit, start-up is defined as the period beginning with the first fuel fed to the compressor turbine and ending when the compressor turbine reaches 50% load.

4(b). For the purpose of this permit, shutdown is defined as the period beginning when the compressor turbine drops below 50% load for the purpose of ceasing operation and ends when fuel feeding stops.”¹⁵

¹² The purpose of the VGRS is to minimize emissions of the pipeline gas during venting events associated with maintenance and other activities. Without proper operation of the VGRS, more gas would be vented to the atmosphere, leading to greater likelihood of adverse air quality and health impacts.

¹³ “The SoLoNO_x technology shall be in operation at all times the respective compressor turbine is operating except during start-up and shutdown.” (emphasis added)

“Each SCR shall be in operation at all times the respective compressor turbine is operating, except during start-up and shutdown...” (emphasis added)

¹⁴ “Each oxidation catalyst system...shall be in operation at all times the respective compressor turbine is operating, except during each unit start-up.” (emphasis added)

The VDEQ does not provide any support for the choice of 50% load as being the appropriate upper-bound for the end of start-up or the beginning of shutdown. Thus, for CT-01, per its rated load of 15,900 hp, start-up would be up to 7,950 hp – which is greater than the entire rated load for CT-04. Similarly, for CT-03, per its rated load of 20,500 hp, start-up could be up to 10,250 hp. Again, that is more than the rated load for CT-04 and almost the rated load for CT-02. In other words, as long as CT-01 and CT-03 run between 0 and 7,950 hp and between 0 and 10,250 hp, respectively, they can effectively run uncontrolled without having to engage the NO_x and CO/VOC controls that they are equipped with. Put another way, since the entire station size is around 54,000 hp, these definitions of start-up and shutdown allow uncontrolled operations up to 27,000 hp considering all four turbines. This is half of the compressor station's maximum power output. Even though the permit caps the total time that a turbine can be in start-up and shutdown modes, nonetheless significant emissions can result during start-up and shutdown, given the large sizes of the turbines.

In light of this potentially large start-up and shutdown loophole, which can simply eviscerate the permit, the VDEQ should be directed to:

- (i) provide justification for the size of the station and each turbine, for the intended gas conveyance duty; and
- (ii) change the definition of the end of start-up or beginning or shutdown to a much smaller load – justified on each turbine's operating characteristics as well as the characteristics of the respective controls and the earliest point they can be engaged.

7. The Permit Provides No Rationale for the Minimum Operating Temperature of the Oxidation Catalyst

Paragraph 2 on page 6 of the draft permit states: “[A]n oxidation catalyst system shall be considered in operation when the catalyst bed inlet gas temperature is above 490°F.” Since this oxidation catalyst is supposed to reduce CO and VOC emissions, including many toxic air compounds that are VOCs, it is important that it remain operational for the widest possible

¹⁵ Draft Permit, p. 6.

temperature range. Yet, the permit simply includes the 490 F minimum operating temperature for the catalyst without any technical support.

I ask that the record and permit adequately support and identify the lowest possible minimum operating temperature of the oxidation catalyst. The record should include the operating characteristics from various vendors of different oxidation catalysts and the permit should require that the oxidation catalyst with the lowest minimum operating temperature be used.

8. The Control Efficiency of SCR is Unsupported and Too Low

Each of the four turbines uses SCR to control NO_x. However, the control efficiency for SCR is stated as 58%. The SCR vendor (Peerless) data uses 58.33% value as best as I could read the vendor tables.¹⁶ However, neither the permit application nor anything from the vendor indicates why this value was chosen. More importantly, it is not clear why a higher value could not be used, resulting in lower NO_x limits for the turbines. Thus, this assumption of just 58% NO_x removal efficiency by the applicant is unsupported. I ask that the DEQ provide support for this assumption and additional technical justification as to why higher control efficiencies are not possible.

9. The Time Allowed to Repair Leaking Components Should be Reduced

The draft permit, condition 7(b) on page 9, states: “[T]he first attempt to repair any fugitive emissions component found to be leaking during an AVO¹⁷ inspection or a quarterly survey shall be made as soon as practicable but no later than 5 days after discovery. The leaking fugitive emissions component shall be repaired within 15 days of discovery.” (emphasis added). The proposed compressor station is not like a refinery with tens of thousands of fugitive components. Thus, allowing up to 5 days for a first attempt at repairing a component leaking highly flammable natural gas means allowing large quantities of leaking gas, including other VOCs, to escape. There is no justification for why the first attempt at repair cannot be made sooner. I suggest 24 hours. And, similarly, I suggest shortening the maximum time allowed for repair to be no more than 3 days. This will allow the facility to keep adequate spare components onsite and not have an

¹⁶ Attachment 3 to the June 29, 2018 comment responses to DEQ.

¹⁷ AVO stands for audio, visual, and olfactory means of detecting a leak – i.e., relying on the senses of the human observer.

extended period of uncontrolled leaks of fugitive natural gas and VOCs from the facility. Not only is the safety of the operating personnel at risk by this overly lax term but also is the safety of surrounding community members some who live within close proximity of the proposed site.

10. Reporting Provisions in the Draft Permit Are Inadequate

Conditions 8, 9, 10, 11, and 12 in the draft permit contain several monitoring provisions for various turbine as well as air pollution control parameters. Condition 16 requires fuel monitoring for sulfur content. Condition 17 requires tracking the operating hours of the emergency engine. Condition 35 requires that the facility keep onsite records of the various monitoring parameters. However, reporting to the public and the DEQ, discussed in Condition 36, is very limited. Other than certifying compliance and/or reporting exceedances, excursions, etc. – none of which are independently verifiable without a review of the underlying records – the reporting provisions in Condition 36 are very weak. All of the monitoring as well as testing records should be kept not only onsite but also be publicly reported in quarterly reports.

11. The Draft Permit Should t Require Continuous Monitoring of Emissions from the Turbines

A glaring omission in the draft permit is the lack of any Continuous Emissions Monitors (CEMs) for any of the pollutants that will be emitted from, at least, the four turbines.¹⁸ While the permit requires continuous monitoring of various operating parameters, curiously it only relies on stack testing (Conditions 29 and 31) to verify that the emission limits of various pollutants for each of the turbines (Conditions 20, 21, 22, and 23). Stack testing, no matter how frequent, is no substitute for directly monitoring the emissions using CEMS. CEMS for all of the major pollutants expected to be emitted from each of the turbines, including NO_x, CO, SO₂, VOCs, filterable PM, and VOCs are widely available and in use at similar sources. Thus, there is absolutely no justification whatsoever to not specify that CEMS for these pollutants as well as continuous flow monitors (so that, in combination, the mass emissions specified in Conditions 20-23) are required at each of the four turbines.

¹⁸ The proposed permit also allows emissions from other sources associated with the compressor station.

Further, since Conditions 20-23 note that the limits specified in these permits as a “3-hour average,” only the use of CEMS can ensure that the limits at each turbine are being met for all times – and not just for the single 3-hour period of a stack test which is required every two years per Condition 31. Without CEMS, staged stack tests for 3 hours every 2 years at each turbine cannot represent actual operations for all of the other times that the turbines will be operating. Three hours of monitoring every 2 years represents a miniscule 0.017% of the operating time of each turbine. Thus, the proposed permit does little to ensure compliance with the emissions limits specified in Conditions 20-23. The Board and DEQ should amend the permit to require CEMS for NO_x, CO, VOC, SO₂, filterable PM, and flow at each turbine stack. All of the CEMs data collected should be made publicly available both online and in paper format.

12. The Permit Does Not Contain Limits for Many Air Toxic Compounds that will be Emitted and Implicitly Underestimates the Potential Health Risks Posed by the Facility

Combusting natural gas in turbines such as the ones proposed for this compressor station will result in the emissions of many partially combusted, so-called “products of incomplete combustion.” Table 3.1-3 from US EPA’s AP-42 compilation of emission factors,¹⁹ shown below, lists 11 air toxic compounds or families of compounds emitted from the combustion of natural gas, the source of fuel for the turbines being permitted.

¹⁹ Available at <https://www3.epa.gov/ttn/chief/ap42/ch03/index.html>

Table 3.1-3. EMISSION FACTORS FOR HAZARDOUS AIR POLLUTANTS
FROM NATURAL GAS-FIRED STATIONARY GAS TURBINES^a

Emission Factors ^b - Uncontrolled		
Pollutant	Emission Factor (lb/MMBtu) ^c	Emission Factor Rating
1,3-Butadiene ^d	< 4.3 E-07	D
Acetaldehyde	4.0 E-05	C
Acrolein	6.4 E-06	C
Benzene ^e	1.2 E-05	A
Ethylbenzene	3.2 E-05	C
Formaldehyde ^f	7.1 E-04	A
Naphthalene	1.3 E-06	C
PAH	2.2 E-06	C
Propylene Oxide ^d	< 2.9 E-05	D
Toluene	1.3 E-04	C
Xylenes	6.4 E-05	C

While the list of potential air toxic compounds listed in Table 3.1-3 is by no means complete, it should be a starting point for estimating the emissions from the four turbines proposed at the facility. Yet, the draft permit discusses only two potential compounds – formaldehyde (Condition 47) and hexane (Condition 48). On its face, the draft permit is simply incorrect, incomplete, and inadequate in not addressing the many other toxic air contaminants that will be emitted from this facility. Since many of these air toxic compounds can pose significant health hazards to exposed individuals, not including a thorough analysis (and appropriate limits) for such compounds is a failure of the regulatory process.²⁰

DEQ should be directed to:

- (i) properly estimate the quantities of all air toxic compounds that will be emitted from the facility including from the four turbines as well as the fugitive non-combustion sources;

²⁰ See the expert testimony of Dr. George Thurston which accompanies the Chesapeake Bay Foundation's comments.

- (ii) require testing and verification of the emissions estimated in (i) above on a periodic basis; and
- (iii) conduct a health risk assessment, using conservative assumptions, to quantify the health impacts of such emissions on the population in the vicinity of the proposed station and confirm that the incremental health risks are not unacceptable.

13. Impacts Due to Hexane and Formaldehyde Emissions Are Likely to be Significant

The revised modeling report summarizes the ambient impacts for hexane and formaldehyde as excerpted below (red boxes are my notations):

Table 4-3 Air Toxics Model Results

Pollutant	Averaging Period	Scenario	Significant Concentration ($\mu\text{g}/\text{m}^3$)	Model Result ($\mu\text{g}/\text{m}^3$)
Formaldehyde	1-hour	50% Load	62.5	38.9
		75% Load		38.9
		100% Load		38.9
		Startup (blended with 50% load)		40.5
		Shutdown (blended with 50% load)		40.2
	Annual	50% Load	2.4	0.081
		75% Load		0.079
		100% Load		0.076
Hexane 1-	hour	Pigging (Launching)	8,800	6,277
		Pigging (Receiving)		6,897
		Purging from Startup Events		1,370
		Blowdown from Shutdown Events		4,518
		Normal Operations		20

Setting aside the justification for the two “significant concentration” values shown above for formaldehyde and hexane, it is clear that the model results are not significantly lower than the significant concentrations. Since both of these are toxic air contaminants, it behooves the DEQ to closely examine the many assumptions that underlie these estimated results.

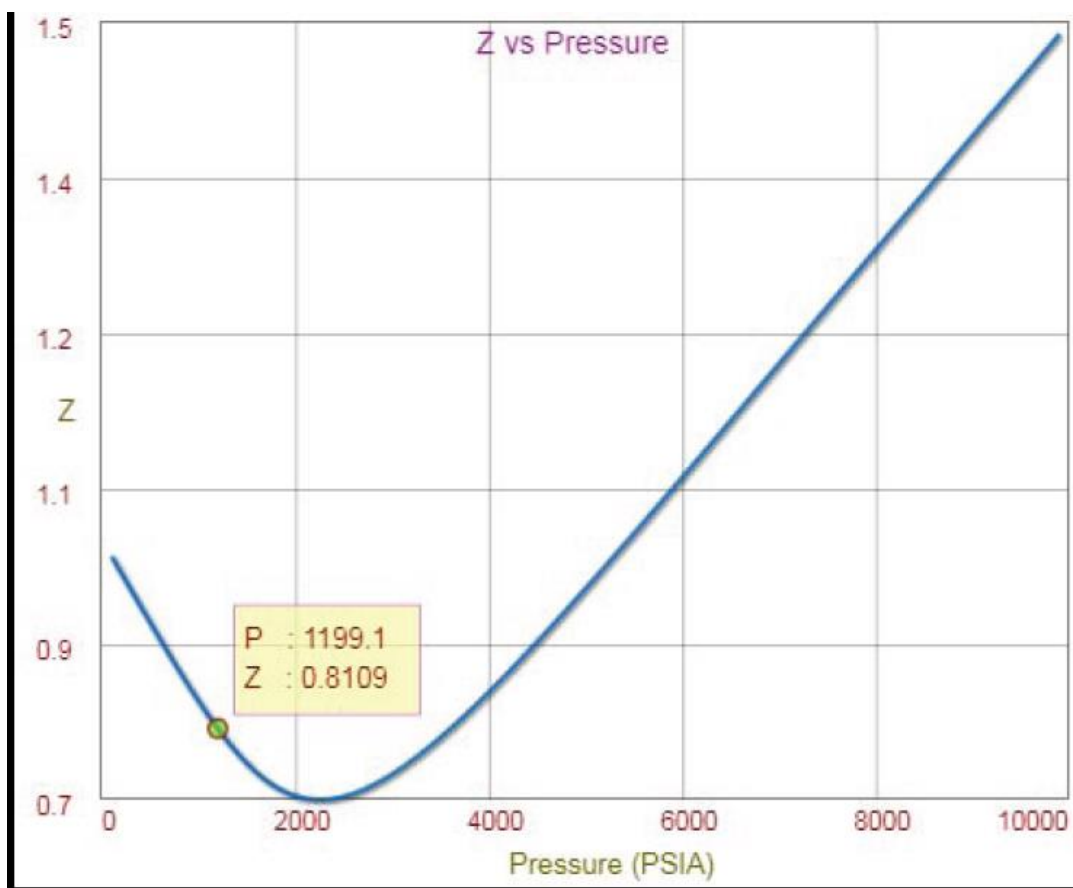
As previously noted, one of the key inputs for the modeling results shown above are the emissions inputs.

For formaldehyde, I have discussed earlier that the applicant cannot rely on the manufacturer's data (which Solar does not warranty, since the data were not generated by Solar to begin with). And, it is clear that instead of using maximum values of formaldehyde that should have been used, at best a 95th percentile value was used. Since, as noted earlier, per Solar itself, many factors can and will affect formaldehyde emissions from each of the turbines, simply plucking the value from Table 1 of Solar PIL-168 is not appropriate. Given the small margin by which the model concentration is lower than the significant concentration (i.e., only around 2/3 of the significant concentration), which can easily be overcome with modest variability in the formaldehyde emissions, it is my opinion that actual formaldehyde impacts have been underpredicted.

For hexane, which the table above shows also has impacts that are not too much lower than its corresponding significant level, the emissions calculations rely on many assumptions, including as a starting point the hexane concentration in the gas itself. This is noted as 0.032% in Table C-3A of the revised emissions calculations. Yet, it is not likely that the level of hexane in the gas will be constant, at just this value. There is no discussion of the variability of hexane in the gas – especially given the long life of this facility. As an example, if this miniscule level of hexane were to be doubled, the predicted model concentrations in the table above would exceed the significant concentration under several scenarios. Yet, nowhere does the record indicate that the 0.032% level of hexane in the gas is the maximum value that can be expected.

Of course, there are also many additional numerous assumptions that underlie the mass estimates of hexane emissions used in the analysis besides the concentration of hexane in the gas, such as those shown that accompany the July 13, 2018 response to DEQ. An important assumption is the line pressure, assumed to be “maximum operating pressure” of 1200 psi. As I have pointed out earlier, the FEIS (and earlier versions of the calculations) have assumed that the line pressure will be 1400 psi or more. Of course, one should expect greater emissions of gas (and hexane) with greater line pressures. The tables accompanying the July 13, 2018 submittal contain numerous pipe geometry assumptions (such as lengths and diameters, etc. which are used to estimate the volume of gas, containing hexane, that will be vented) – and these are not enforceable under the

permit as written. The tables contain yet other assumptions used to estimate the vent gas (and hexane) mass – such as the assumed compressibility factor Z . Z is assumed to be 0.87356 “based on engineering estimate provided by DETI” per Note 5 under the unnumbered table. Yet, there is no support for this. Shown below is a screen-shot of Z for natural gas, from an engineering calculator²¹ using the same composition of the natural gas as represented in the final emissions calculations, at 1200 psi, using the well-known Dranchuk and Abou-Kassem equation of state (DAK - EOS). It is significantly different than 0.87356 assumed in the calculations.



Given all of the above (and additional technical deficiencies that are too numerous to list), it is my opinion that the modeled level of hexane will under-predict actual impacts of this harmful toxic air contaminant. Before the Air Board considers approving a permit for this station, it should

²¹ <https://checalculator.com/solved/naturalgasZ.html>

require DEQ to re-model hexane emissions from the proposed station and determine their potential to harm workers or residents and report its findings to the Board.

14. The Draft Permit Does Not Include Estimates of Greenhouse Gases That Will Be Emitted from the Facility

Methane, the largest component of natural gas, as well as N₂O and CO₂ – both combustion products of natural gas, are greenhouse gases. Yet, the permit simply does not mention, much less quantify the emissions of all three of these greenhouse gases. Regardless of whether controls are required for greenhouse gases, it is simply unacceptable for the permit to not acknowledge and quantify the emissions of greenhouse gases from the facility especially in light of the significant risks posed to the Commonwealth of Virginia and its citizens from sea level rise and climate change.²² The DEQ should remedy this omission before issuing the final permit.

15. The Draft Permit Does Not Contain Estimates of Emissions from Accidental Events That May Occur

Natural gas is a flammable substance. Explosions at facilities like the proposed compressor station have occurred several locations such as Artemas, Pennsylvania, Branchford, New Jersey and Watford City, North Dakota.²³ As such, it is not impossible for there to be potential fires and explosions at the compressor station or at the locations of the incoming and outgoing pipelines. While the probability of such accidents is low, the consequences, if any such accident occurs, would be catastrophic. In addition to the harm from the fires or explosions themselves, such events will also create large quantities of harmful air emissions. The permit does not attempt any quantification of such accidental air emissions, thereby underplaying potential adverse air impacts from the proposed facility. The DEQ should address this in a forthright manner prior to issuance of the final permit.

²² See, Nolan, et al., *Past and future global transformation of terrestrial ecosystems under climate change*, Science, Vol. 361, Issue 6405, pp. 920-923, 31 Aug. 2018. <http://science.sciencemag.org/content/361/6405/920> Natural gas leaks could match climate impacts of coal-burning power plants. <http://www.sciencemag.org/news/2018/06/natural-gas-could-warm-planet-much-coal-short-term>

²³ http://www.times-news.com/news/local_news/gas-explosion-fire-forces-evacuations/article_d6d3b5fa-12d7-57d2-aab4-670b8e514444.html ; <http://www.watfordcitynd.com/?id=10&nid=3533>;

16. The Record's Analysis of the Ozone or Secondary PM_{2.5} Impacts Due to Precursor Pollutants from the Facility is Deficient

Both NO_x and VOCs, which will be emitted from the proposed facility, are precursors of ozone. Similarly, NO_x and SO₂ are precursors of PM_{2.5}, a secondary pollutant that will be formed in the atmosphere. The facility will be located in Virginia where the City of Richmond and several counties upwind of the proposed compressor station are in ozone non-attainment. https://www3.epa.gov/airquality/greenbook/anayo_va.html. In addition, northern Virginia is part of the broader Northeast ozone non-attainment area. As such, any incremental ozone formation associated with the compressor station will adversely affect not only Virginia but also all downwind states from achieving attainment of the ozone National Ambient Air Quality Standard (NAAQS).

As to PM_{2.5}, fine PM in this size range is one of the most harmful air pollutants since they have no threshold for harm, which includes not only respiratory but also cardiac impacts.²⁴

The revised Modeling Report discusses how ozone impacts were estimated from the facility at Section 3.5.2. Secondary PM_{2.5} is discussed in Section 3.5.1. Instead of actually modeling the ozone levels that would occur, using well-known photochemical models, the analysis presented relies on the so-called Modeled Emission rates of Precursors (MERP) approach as discussed in Section 3.5 of the revised Modeling Report. First, in relying on the **draft** December 2016 guidance memorandum as referenced in the Modeling Report, the applicant is perhaps unaware of the update to this guidance. In short, while EPA allows the MERP analysis, there are numerous caveats:

First, echoing what I have stated above, EPA explicitly states that,

“The EPA believes photochemical grid models are generally most appropriate for addressing ozone and secondary PM_{2.5}, because they provide a spatially and temporally dynamic realistic chemical and physical environment for plume growth and chemical transformation.”²⁵

²⁴ See the comments of Dr. George Thurston attached to the comments of the Chesapeake Bay Foundation.

²⁵ Fox, Tyler and Baker, Kirk, Update on MERPs Guidance, US EPA/OAQPS/Air Quality Modeling Group, June 5, 2018, p. 3. Available at https://www3.epa.gov/ttn/scram/2018_RSL/Presentations/1-21_2018_RSL-MERPs.pdf

EPA goes on to emphasize that when the MERP approach is used, it should rely on, among other things:

“... air quality modeling of hypothetical industrial sources with similar source characteristics and emission rates of precursors that are located in similar atmospheric environments and for time periods that are conducive to the formation of O₃ or secondary PM_{2.5}.” (emphasis added).²⁶

In this instance, the revised Modeling Report states that: “Atlantic and DETI have considered model results from the EPA hypothetical source that is closest to the project location. Specifically, model results from EPA Source 9 located in Dinwiddie County, VA...” NO_x, SO₂, and VOC emissions from this hypothetical source have been assumed to be 500 tons/year each (as compared to the estimated 34.2 tons/year of NO_x, 8.3 tons/year of SO₂ and 9.77 tons/year of VOC emissions for the compressor station).

Given the disparate sizes of the modeled source, the compressor station, the different release profiles, the dissimilar air sheds into which the precursor emissions are emitted, it is my opinion that the MERP approach used in the record to discount the formation of ozone and secondary PM_{2.5} from the compressor station, are unreliable. DEQ should ask that direct modeling of these impacts be used.

17. A Revised Draft Permit Should be Reissued for Public Comment

I have identified several significant deficiencies in the subject draft permit issued by the DEQ. Addressing these many deficiencies will require additional work by the DEQ and the applicant. Several aspects of the draft permit either contain vague and uncertain terms or lack sufficient and long-term compliance assurance measures. Given these defects, I recommend that the Board reject the proposed permit and require DEQ to revise the draft accordingly. I further recommend that the DEQ reissue the revised permit for public comment to ensure that the comments I have raised, as well as those others may raise, are fully addressed prior to permit issuance.

²⁶ Id. at p. 5.

Attachment A

RANAJIT (RON) SAHU, Ph.D, QEP, CEM (Nevada)

CONSULTANT, ENVIRONMENTAL AND ENERGY ISSUES

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EXPERIENCE SUMMARY

Dr. Sahu has over twenty eight years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services; design and specification of pollution control equipment for a wide range of emissions sources including stationary and mobile sources; soils and groundwater remediation including landfills as remedy; combustion engineering evaluations; energy studies; multimedia environmental regulatory compliance (involving statutes and regulations such as the Federal CAA and its Amendments, Clean Water Act, TSCA, RCRA, CERCLA, SARA, OSHA, NEPA as well as various related state statutes); transportation air quality impact analysis; multimedia compliance audits; multimedia permitting (including air quality NSR/PSD permitting, Title V permitting, NPDES permitting for industrial and storm water discharges, RCRA permitting, etc.), multimedia/multi-pathway human health risk assessments for toxics; air dispersion modeling; and regulatory strategy development and support including negotiation of consent agreements and orders.

He has over twenty five years of project management experience and has successfully managed and executed numerous projects in this time period. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public.

He has provided consulting services to numerous private sector, public sector and public interest group clients. His major clients over the past twenty five years include various trade associations as well as individual companies such as steel mills, petroleum refineries, cement manufacturers, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, and various entities in the public sector including EPA, the US Dept. of Justice, several states, various agencies such as the California DTSC, various municipalities, etc.). Dr. Sahu has performed projects in all 50 states, numerous local jurisdictions and internationally.

In addition to consulting, Dr. Sahu has taught numerous courses in several Southern California universities including UCLA (air pollution), UC Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management) for the past seventeen years. In this time period he has also taught at Caltech, his alma mater (various engineering courses), at the University of Southern California (air pollution controls) and at California State University, Fullerton (transportation and air quality).

Dr. Sahu has and continues to provide expert witness services in a number of environmental areas discussed above in both state and Federal courts as well as before administrative bodies (please see Annex A).

EXPERIENCE RECORD

2000-present **Independent Consultant.** Providing a variety of private sector (industrial companies, land development companies, law firms, etc.) public sector (such as the US Department of Justice) and public interest group clients with project management, air quality consulting, waste remediation and management consulting, as well as regulatory and engineering support consulting services.

- 1995-2000 Parsons ES, **Associate, Senior Project Manager and Department Manager for Air Quality/Geosciences/Hazardous Waste Groups**, Pasadena. Responsible for the management of a group of approximately 24 air quality and environmental professionals, 15 geoscience, and 10 hazardous waste professionals providing full-service consulting, project management, regulatory compliance and A/E design assistance in all areas.
- Parsons ES, **Manager for Air Source Testing Services**. Responsible for the management of 8 individuals in the area of air source testing and air regulatory permitting projects located in Bakersfield, California.
- 1992-1995 Engineering-Science, Inc. **Principal Engineer and Senior Project Manager** in the air quality department. Responsibilities included multimedia regulatory compliance and permitting (including hazardous and nuclear materials), air pollution engineering (emissions from stationary and mobile sources, control of criteria and air toxics, dispersion modeling, risk assessment, visibility analysis, odor analysis), supervisory functions and project management.
- 1990-1992 Engineering-Science, Inc. **Principal Engineer and Project Manager** in the air quality department. Responsibilities included permitting, tracking regulatory issues, technical analysis, and supervisory functions on numerous air, water, and hazardous waste projects. Responsibilities also include client and agency interfacing, project cost and schedule control, and reporting to internal and external upper management regarding project status.
- 1989-1990 Kinetics Technology International, Corp. **Development Engineer**. Involved in thermal engineering R&D and project work related to low-NO_x ceramic radiant burners, fired heater NO_x reduction, SCR design, and fired heater retrofitting.
- 1988-1989 Heat Transfer Research, Inc. **Research Engineer**. Involved in the design of fired heaters, heat exchangers, air coolers, and other non-fired equipment. Also did research in the area of heat exchanger tube vibrations.

EDUCATION

- 1984-1988 Ph.D., Mechanical Engineering, California Institute of Technology (Caltech), Pasadena, CA.
- 1984 M. S., Mechanical Engineering, Caltech, Pasadena, CA.
- 1978-1983 B. Tech (Honors), Mechanical Engineering, Indian Institute of Technology (IIT) Kharagpur, India

TEACHING EXPERIENCE

Caltech

- "Thermodynamics," Teaching Assistant, California Institute of Technology, 1983, 1987.
- "Air Pollution Control," Teaching Assistant, California Institute of Technology, 1985.
- "Caltech Secondary and High School Saturday Program," - taught various mathematics (algebra through calculus) and science (physics and chemistry) courses to high school students, 1983-1989.
- "Heat Transfer," - taught this course in the Fall and Winter terms of 1994-1995 in the Division of Engineering and Applied Science.
- "Thermodynamics and Heat Transfer," Fall and Winter Terms of 1996-1997.

U.C. Riverside, Extension

- "Toxic and Hazardous Air Contaminants," University of California Extension Program, Riverside, California. Various years since 1992.
- "Prevention and Management of Accidental Air Emissions," University of California Extension Program, Riverside, California. Various years since 1992.

"Air Pollution Control Systems and Strategies," University of California Extension Program, Riverside, California, Summer 1992-93, Summer 1993-1994.

"Air Pollution Calculations," University of California Extension Program, Riverside, California, Fall 1993-94, Winter 1993-94, Fall 1994-95.

"Process Safety Management," University of California Extension Program, Riverside, California. Various years since 1992-2010.

"Process Safety Management," University of California Extension Program, Riverside, California, at SCAQMD, Spring 1993-94.

"Advanced Hazard Analysis - A Special Course for LEPCs," University of California Extension Program, Riverside, California, taught at San Diego, California, Spring 1993-1994.

"Advanced Hazardous Waste Management" University of California Extension Program, Riverside, California. 2005.

Loyola Marymount University

"Fundamentals of Air Pollution - Regulations, Controls and Engineering," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1993.

"Air Pollution Control," Loyola Marymount University, Dept. of Civil Engineering, Fall 1994.

"Environmental Risk Assessment," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1998.

"Hazardous Waste Remediation" Loyola Marymount University, Dept. of Civil Engineering. Various years since 2006.

University of Southern California

"Air Pollution Controls," University of Southern California, Dept. of Civil Engineering, Fall 1993, Fall 1994.

"Air Pollution Fundamentals," University of Southern California, Dept. of Civil Engineering, Winter 1994.

University of California, Los Angeles

"Air Pollution Fundamentals," University of California, Los Angeles, Dept. of Civil and Environmental Engineering, Spring 1994, Spring 1999, Spring 2000, Spring 2003, Spring 2006, Spring 2007, Spring 2008, Spring 2009.

International Programs

"Environmental Planning and Management," 5 week program for visiting Chinese delegation, 1994.

"Environmental Planning and Management," 1 day program for visiting Russian delegation, 1995.

"Air Pollution Planning and Management," IEP, UCR, Spring 1996.

"Environmental Issues and Air Pollution," IEP, UCR, October 1996.

PROFESSIONAL AFFILIATIONS AND HONORS

President of India Gold Medal, IIT Kharagpur, India, 1983.

Member of the Alternatives Assessment Committee of the Grand Canyon Visibility Transport Commission, established by the Clean Air Act Amendments of 1990, 1992-present.

American Society of Mechanical Engineers: Los Angeles Section Executive Committee, Heat Transfer Division, and Fuels and Combustion Technology Division, 1987-present.

Air and Waste Management Association, West Coast Section, 1989-present.

PROFESSIONAL CERTIFICATIONS

EIT, California (#XE088305), 1993.

REA I, California (#07438), 2000.

Certified Permitting Professional, South Coast AQMD (#C8320), since 1993.

QEP, Institute of Professional Environmental Practice, since 2000.

CEM, State of Nevada (#EM-1699). Expiration 10/07/2017.

PUBLICATIONS (PARTIAL LIST)

"Physical Properties and Oxidation Rates of Chars from Bituminous Coals," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **67**, 275-283 (1988).

"Char Combustion: Measurement and Analysis of Particle Temperature Histories," with R.C. Flagan, G.R. Gavalas and P.S. Northrop, *Comb. Sci. Tech.* **60**, 215-230 (1988).

"On the Combustion of Bituminous Coal Chars," PhD Thesis, California Institute of Technology (1988).

"Optical Pyrometry: A Powerful Tool for Coal Combustion Diagnostics," *J. Coal Quality*, **8**, 17-22 (1989).

"Post-Ignition Transients in the Combustion of Single Char Particles," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **68**, 849-855 (1989).

"A Model for Single Particle Combustion of Bituminous Coal Char." Proc. ASME National Heat Transfer Conference, Philadelphia, **HTD-Vol. 106**, 505-513 (1989).

"Discrete Simulation of Cenospheric Coal-Char Combustion," with R.C. Flagan and G.R. Gavalas, *Combust. Flame*, **77**, 337-346 (1989).

"Particle Measurements in Coal Combustion," with R.C. Flagan, in "**Combustion Measurements**" (ed. N. Chigier), Hemisphere Publishing Corp. (1991).

"Cross Linking in Pore Structures and Its Effect on Reactivity," with G.R. Gavalas in preparation.

"Natural Frequencies and Mode Shapes of Straight Tubes," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Optimal Tube Layouts for Kamui SL-Series Exchangers," with K. Ishihara, Proprietary Report for Kamui Company Limited, Tokyo, Japan (1990).

"HTRI Process Heater Conceptual Design," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Asymptotic Theory of Transonic Wind Tunnel Wall Interference," with N.D. Malmuth and others, Arnold Engineering Development Center, Air Force Systems Command, USAF (1990).

"Gas Radiation in a Fired Heater Convection Section," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1990).

"Heat Transfer and Pressure Drop in NTIW Heat Exchangers," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1991).

"NOx Control and Thermal Design," Thermal Engineering Tech Briefs, (1994).

"From Purchase of Landmark Environmental Insurance to Remediation: Case Study in Henderson, Nevada," with Robin E. Bain and Jill Quillin, presented at the AQMA Annual Meeting, Florida, 2001.

"The Jones Act Contribution to Global Warming, Acid Rain and Toxic Air Contaminants," with Charles W. Botsford, presented at the AQMA Annual Meeting, Florida, 2001.

PRESENTATIONS (PARTIAL LIST)

"Pore Structure and Combustion Kinetics - Interpretation of Single Particle Temperature-Time Histories," with P.S. Northrop, R.C. Flagan and G.R. Gavalas, presented at the AIChE Annual Meeting, New York (1987).

"Measurement of Temperature-Time Histories of Burning Single Coal Char Particles," with R.C. Flagan, presented at the American Flame Research Committee Fall International Symposium, Pittsburgh, (1988).

"Physical Characterization of a Cenospheric Coal Char Burned at High Temperatures," with R.C. Flagan and G.R. Gavalas, presented at the Fall Meeting of the Western States Section of the Combustion Institute, Laguna Beach, California (1988).

"Control of Nitrogen Oxide Emissions in Gas Fired Heaters - The Retrofit Experience," with G. P. Croce and R. Patel, presented at the International Conference on Environmental Control of Combustion Processes (Jointly sponsored by the American Flame Research Committee and the Japan Flame Research Committee), Honolulu, Hawaii (1991).

"Air Toxics - Past, Present and the Future," presented at the Joint AIChE/AAEE Breakfast Meeting at the AIChE 1991 Annual Meeting, Los Angeles, California, November 17-22 (1991).

"Air Toxics Emissions and Risk Impacts from Automobiles Using Reformulated Gasolines," presented at the Third Annual Current Issues in Air Toxics Conference, Sacramento, California, November 9-10 (1992).

"Air Toxics from Mobile Sources," presented at the Environmental Health Sciences (ESE) Seminar Series, UCLA, Los Angeles, California, November 12, (1992).

"Kilns, Ovens, and Dryers - Present and Future," presented at the Gas Company Air Quality Permit Assistance Seminar, Industry Hills Sheraton, California, November 20, (1992).

"The Design and Implementation of Vehicle Scrapping Programs," presented at the 86th Annual Meeting of the Air and Waste Management Association, Denver, Colorado, June 12, 1993.

"Air Quality Planning and Control in Beijing, China," presented at the 87th Annual Meeting of the Air and Waste Management Association, Cincinnati, Ohio, June 19-24, 1994.

Annex A

Expert Litigation Support

A. Occasions where Dr. Sahu has provided Written or Oral testimony before Congress:

1. In July 2012, provided expert written and oral testimony to the House Subcommittee on Energy and the Environment, Committee on Science, Space, and Technology at a Hearing entitled “Hitting the Ethanol Blend Wall – Examining the Science on E15.”

B. Matters for which Dr. Sahu has provided affidavits and expert reports include:

2. Affidavit for Rocky Mountain Steel Mills, Inc. located in Pueblo Colorado – dealing with the technical uncertainties associated with night-time opacity measurements in general and at this steel mini-mill.
3. Expert reports and depositions (2/28/2002 and 3/1/2002; 12/2/2003 and 12/3/2003; 5/24/2004) on behalf of the United States in connection with the Ohio Edison NSR Cases. *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (Southern District of Ohio).
4. Expert reports and depositions (5/23/2002 and 5/24/2002) on behalf of the United States in connection with the Illinois Power NSR Case. *United States v. Illinois Power Co., et al.*, 99-833-MJR (Southern District of Illinois).
5. Expert reports and depositions (11/25/2002 and 11/26/2002) on behalf of the United States in connection with the Duke Power NSR Case. *United States, et al. v. Duke Energy Corp.*, 1:00-CV-1262 (Middle District of North Carolina).
6. Expert reports and depositions (10/6/2004 and 10/7/2004; 7/10/2006) on behalf of the United States in connection with the American Electric Power NSR Cases. *United States, et al. v. American Electric Power Service Corp., et al.*, C2-99-1182, C2-99-1250 (Southern District of Ohio).
7. Affidavit (March 2005) on behalf of the Minnesota Center for Environmental Advocacy and others in the matter of the Application of Heron Lake BioEnergy LLC to construct and operate an ethanol production facility – submitted to the Minnesota Pollution Control Agency.
8. Expert Report and Deposition (10/31/2005 and 11/1/2005) on behalf of the United States in connection with the East Kentucky Power Cooperative NSR Case. *United States v. East Kentucky Power Cooperative, Inc.*, 5:04-cv-00034-KSF (Eastern District of Kentucky).
9. Affidavits and deposition on behalf of Basic Management Inc. (BMI) Companies in connection with the BMI vs. USA remediation cost recovery Case.
10. Expert Report on behalf of Penn Future and others in the Cambria Coke plant permit challenge in Pennsylvania.
11. Expert Report on behalf of the Appalachian Center for the Economy and the Environment and others in the Western Greenbrier permit challenge in West Virginia.
12. Expert Report, deposition (via telephone on January 26, 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women’s Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) in the Thompson River Cogeneration LLC Permit No. 3175-04 challenge.
13. Expert Report and deposition (2/2/07) on behalf of the Texas Clean Air Cities Coalition at the Texas State Office of Administrative Hearings (SOAH) in the matter of the permit challenges to TXU Project Apollo’s eight new proposed PRB-fired PC boilers located at seven TX sites.
14. Expert Testimony (July 2007) on behalf of the Izaak Walton League of America and others in connection with the acquisition of power by Xcel Energy from the proposed Gascoyne Power Plant – at the State of

- Minnesota, Office of Administrative Hearings for the Minnesota PUC (MPUC No. E002/CN-06-1518; OAH No. 12-2500-17857-2).
15. Affidavit (July 2007) Comments on the Big Cajun I Draft Permit on behalf of the Sierra Club – submitted to the Louisiana DEQ.
 16. Expert Report and Deposition (12/13/2007) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case. *Plaintiffs v. Allegheny Energy Inc., et al.*, 2:05cv0885 (Western District of Pennsylvania).
 17. Expert Reports and Pre-filed Testimony before the Utah Air Quality Board on behalf of Sierra Club in the Sevier Power Plant permit challenge.
 18. Expert Report and Deposition (October 2007) on behalf of MTD Products Inc., in connection with *General Power Products, LLC v MTD Products Inc.*, 1:06 CVA 0143 (Southern District of Ohio, Western Division) .
 19. Expert Report and Deposition (June 2008) on behalf of Sierra Club and others in the matter of permit challenges (Title V: 28.0801-29 and PSD: 28.0803-PSD) for the Big Stone II unit, proposed to be located near Milbank, South Dakota.
 20. Expert Reports, Affidavit, and Deposition (August 15, 2008) on behalf of Earthjustice in the matter of air permit challenge (CT-4631) for the Basin Electric Dry Fork station, under construction near Gillette, Wyoming before the Environmental Quality Council of the State of Wyoming.
 21. Affidavits (May 2010/June 2010 in the Office of Administrative Hearings)/Declaration and Expert Report (November 2009 in the Office of Administrative Hearings) on behalf of NRDC and the Southern Environmental Law Center in the matter of the air permit challenge for Duke Cliffside Unit 6. Office of Administrative Hearing Matters 08 EHR 0771, 0835 and 0836 and 09 HER 3102, 3174, and 3176 (consolidated).
 22. Declaration (August 2008), Expert Report (January 2009), and Declaration (May 2009) on behalf of Southern Alliance for Clean Energy in the matter of the air permit challenge for Duke Cliffside Unit 6. *Southern Alliance for Clean Energy et al., v. Duke Energy Carolinas, LLC*, Case No. 1:08-cv-00318-LHT-DLH (Western District of North Carolina, Asheville Division).
 23. Declaration (August 2008) on behalf of the Sierra Club in the matter of Dominion Wise County plant MACT.us
 24. Expert Report (June 2008) on behalf of Sierra Club for the Green Energy Resource Recovery Project, MACT Analysis.
 25. Expert Report (February 2009) on behalf of Sierra Club and the Environmental Integrity Project in the matter of the air permit challenge for NRG Limestone’s proposed Unit 3 in Texas.
 26. Expert Report (June 2009) on behalf of MTD Products, Inc., in the matter of *Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al.*
 27. Expert Report (August 2009) on behalf of Sierra Club and the Southern Environmental Law Center in the matter of the air permit challenge for Santee Cooper’s proposed Pee Dee plant in South Carolina).
 28. Statements (May 2008 and September 2009) on behalf of the Minnesota Center for Environmental Advocacy to the Minnesota Pollution Control Agency in the matter of the Minnesota Haze State Implementation Plans.
 29. Expert Report (August 2009) on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).
 30. Expert Report and Rebuttal Report (September 2009) on behalf of the Sierra Club, in the matter of challenges to the proposed Medicine Bow Fuel and Power IGL plant in Cheyenne, Wyoming.
 31. Expert Report (December 2009) and Rebuttal reports (May 2010 and June 2010) on behalf of the United States in connection with the Alabama Power Company NSR Case. *United States v. Alabama Power Company*, CV-01-HS-152-S (Northern District of Alabama, Southern Division).

32. Pre-filed Testimony (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed White Stallion Energy Center coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).
33. Pre-filed Testimony (July 2010) and Written Rebuttal Testimony (August 2010) on behalf of the State of New Mexico Environment Department in the matter of Proposed Regulation 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions*, No. EIB 10-04 (R), to the State of New Mexico, Environmental Improvement Board.
34. Expert Report (August 2010) and Rebuttal Expert Report (October 2010) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana) – Liability Phase.
35. Declaration (August 2010), Reply Declaration (November 2010), Expert Report (April 2011), Supplemental and Rebuttal Expert Report (July 2011) on behalf of the United States in the matter of DTE Energy Company and Detroit Edison Company (Monroe Unit 2). *United States of America v. DTE Energy Company and Detroit Edison Company*, Civil Action No. 2:10-cv-13101-BAF-RSW (Eastern District of Michigan).
36. Expert Report and Deposition (August 2010) as well as Affidavit (September 2010) on behalf of Kentucky Waterways Alliance, Sierra Club, and Valley Watch in the matter of challenges to the NPDES permit issued for the Trimble County power plant by the Kentucky Energy and Environment Cabinet to Louisville Gas and Electric, File No. DOW-41106-047.
37. Expert Report (August 2010), Rebuttal Expert Report (September 2010), Supplemental Expert Report (September 2011), and Declaration (November 2011) on behalf of Wild Earth Guardians in the matter of opacity exceedances and monitor downtime at the Public Service Company of Colorado (Xcel)’s Cherokee power plant. No. 09-cv-1862 (District of Colorado).
38. Written Direct Expert Testimony (August 2010) and Affidavit (February 2012) on behalf of Fall-Line Alliance for a Clean Environment and others in the matter of the PSD Air Permit for Plant Washington issued by Georgia DNR at the Office of State Administrative Hearing, State of Georgia (OSAH-BNR-AQ-1031707-98-WALKER).
39. Deposition (August 2010) on behalf of Environmental Defense, in the matter of the remanded permit challenge to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).
40. Expert Report, Supplemental/Rebuttal Expert Report, and Declarations (October 2010, November 2010, September 2012) on behalf of New Mexico Environment Department (Plaintiff-Intervenor), Grand Canyon Trust and Sierra Club (Plaintiffs) in the matter of *Plaintiffs v. Public Service Company of New Mexico* (PNM), Civil No. 1:02-CV-0552 BB/ATC (ACE) (District of New Mexico).
41. Expert Report (October 2010) and Rebuttal Expert Report (November 2010) (BART Determinations for PSCo Hayden and CSU Martin Drake units) to the Colorado Air Quality Commission on behalf of Coalition of Environmental Organizations.
42. Expert Report (November 2010) (BART Determinations for TriState Craig Units, CSU Nixon Unit, and PRPA Rawhide Unit) to the Colorado Air Quality Commission on behalf of Coalition of Environmental Organizations.
43. Declaration (November 2010) on behalf of the Sierra Club in connection with the Martin Lake Station Units 1, 2, and 3. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Case No. 5:10-cv-00156-DF-CMC (Eastern District of Texas, Texarkana Division).
44. Pre-Filed Testimony (January 2011) and Declaration (February 2011) to the Georgia Office of State Administrative Hearings (OSAH) in the matter of Minor Source HAPs status for the proposed Longleaf Energy Associates power plant (OSAH-BNR-AQ-1115157-60-HOWELLS) on behalf of the Friends of the Chattahoochee and the Sierra Club).
45. Declaration (February 2011) in the matter of the Draft Title V Permit for RRI Energy MidAtlantic Power Holdings LLC Shawville Generating Station (Pennsylvania), ID No. 17-00001 on behalf of the Sierra Club.

46. Expert Report (March 2011), Rebuttal Expert Report (June 2011) on behalf of the United States in *United States of America v. Cemex, Inc.*, Civil Action No. 09-cv-00019-MSK-MEH (District of Colorado).
47. Declaration (April 2011) and Expert Report (July 16, 2012) in the matter of the Lower Colorado River Authority (LCRA)'s Fayette (Sam Seymour) Power Plant on behalf of the Texas Campaign for the Environment. *Texas Campaign for the Environment v. Lower Colorado River Authority*, Civil Action No. 4:11-cv-00791 (Southern District of Texas, Houston Division).
48. Declaration (June 2011) on behalf of the Plaintiffs MYTAPN in the matter of Microsoft-Yes, Toxic Air Pollution-No (MYTAPN) v. State of Washington, Department of Ecology and Microsoft Corporation Columbia Data Center to the Pollution Control Hearings Board, State of Washington, Matter No. PCHB No. 10-162.
49. Expert Report (June 2011) on behalf of the New Hampshire Sierra Club at the State of New Hampshire Public Utilities Commission, Docket No. 10-261 – the 2010 Least Cost Integrated Resource Plan (LCIRP) submitted by the Public Service Company of New Hampshire (re. Merrimack Station Units 1 and 2).
50. Declaration (August 2011) in the matter of the Sandy Creek Energy Associates L.P. Sandy Creek Power Plant on behalf of Sierra Club and Public Citizen. *Sierra Club, Inc. and Public Citizen, Inc. v. Sandy Creek Energy Associates, L.P.*, Civil Action No. A-08-CA-648-LY (Western District of Texas, Austin Division).
51. Expert Report (October 2011) on behalf of the Defendants in the matter of *John Quiles and Jeanette Quiles et al. v. Bradford-White Corporation, MTD Products, Inc., Kohler Co., et al.*, Case No. 3:10-cv-747 (TJM/DEP) (Northern District of New York).
52. Declaration (October 2011) on behalf of the Plaintiffs in the matter of *American Nurses Association et al. (Plaintiffs), v. US EPA (Defendant)*, Case No. 1:08-cv-02198-RMC (US District Court for the District of Columbia).
53. Declaration (February 2012) and Second Declaration (February 2012) in the matter of *Washington Environmental Council and Sierra Club Washington State Chapter v. Washington State Department of Ecology and Western States Petroleum Association*, Case No. 11-417-MJP (Western District of Washington).
54. Expert Report (March 2012) and Supplemental Expert Report (November 2013) in the matter of *Environment Texas Citizen Lobby, Inc and Sierra Club v. ExxonMobil Corporation et al.*, Civil Action No. 4:10-cv-4969 (Southern District of Texas, Houston Division).
55. Declaration (March 2012) in the matter of *Center for Biological Diversity, et al. v. United States Environmental Protection Agency*, Case No. 11-1101 (consolidated with 11-1285, 11-1328 and 11-1336) (US Court of Appeals for the District of Columbia Circuit).
56. Declaration (March 2012) in the matter of *Sierra Club v. The Kansas Department of Health and Environment*, Case No. 11-105,493-AS (Holcomb power plant) (Supreme Court of the State of Kansas).
57. Declaration (March 2012) in the matter of the Las Brisas Energy Center *Environmental Defense Fund et al., v. Texas Commission on Environmental Quality*, Cause No. D-1-GN-11-001364 (District Court of Travis County, Texas, 261st Judicial District).
58. Expert Report (April 2012), Supplemental and Rebuttal Expert Report (July 2012), and Supplemental Rebuttal Expert Report (August 2012) on behalf of the states of New Jersey and Connecticut in the matter of the Portland Power plant *State of New Jersey and State of Connecticut (Intervenor-Plaintiff) v. RRI Energy Mid-Atlantic Power Holdings et al.*, Civil Action No. 07-CV-5298 (JKG) (Eastern District of Pennsylvania).
59. Declaration (April 2012) in the matter of the EPA's EGU MATS Rule, on behalf of the Environmental Integrity Project.
60. Expert Report (August 2012) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana) – Harm Phase.
61. Declaration (September 2012) in the Matter of the Application of *Energy Answers Incinerator, Inc.* for a Certificate of Public Convenience and Necessity to Construct a 120 MW Generating Facility in Baltimore City, Maryland, before the Public Service Commission of Maryland, Case No. 9199.

62. Expert Report (October 2012) on behalf of the Appellants (Robert Concilus and Leah Humes) in the matter of Robert Concilus and Leah Humes v. Commonwealth of Pennsylvania Department of Environmental Protection and Crawford Renewable Energy, before the Commonwealth of Pennsylvania Environmental Hearing Board, Docket No. 2011-167-R.
63. Expert Report (October 2012), Supplemental Expert Report (January 2013), and Affidavit (June 2013) in the matter of various Environmental Petitioners v. North Carolina DENR/DAQ and Carolinas Cement Company, before the Office of Administrative Hearings, State of North Carolina.
64. Pre-filed Testimony (October 2012) on behalf of No-Sag in the matter of the North Springfield Sustainable Energy Project before the State of Vermont, Public Service Board.
65. Pre-filed Testimony (November 2012) on behalf of Clean Wisconsin in the matter of Application of Wisconsin Public Service Corporation for Authority to Construct and Place in Operation a New Multi-Pollutant Control Technology System (ReACT) for Unit 3 of the Weston Generating Station, before the Public Service Commission of Wisconsin, Docket No. 6690-CE-197.
66. Expert Report (February 2013) on behalf of Petitioners in the matter of Credence Crematory, Cause No. 12-A-J-4538 before the Indiana Office of Environmental Adjudication.
67. Expert Report (April 2013), Rebuttal report (July 2013), and Declarations (October 2013, November 2013) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).
68. Declaration (April 2013) on behalf of Petitioners in the matter of *Sierra Club, et al., (Petitioners) v. Environmental Protection Agency et al. (Respondents)*, Case No., 13-1112, (Court of Appeals, District of Columbia Circuit).
69. Expert Report (May 2013) and Rebuttal Expert Report (July 2013) on behalf of the Sierra Club in connection with the Luminant Martin Lake Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 5:10-cv-0156-MHS-CMC (Eastern District of Texas, Texarkana Division).
70. Declaration (August 2013) on behalf of A. J. Acosta Company, Inc., in the matter of *A. J. Acosta Company, Inc., v. County of San Bernardino*, Case No. CIVSS803651.
71. Comments (October 2013) on behalf of the Washington Environmental Council and the Sierra Club in the matter of the Washington State Oil Refinery RACT (for Greenhouse Gases), submitted to the Washington State Department of Ecology, the Northwest Clean Air Agency, and the Puget Sound Clean Air Agency.
72. Statement (November 2013) on behalf of various Environmental Organizations in the matter of the Boswell Energy Center (BEC) Unit 4 Environmental Retrofit Project, to the Minnesota Public Utilities Commission, Docket No. E-015/M-12-920.
73. Expert Report (December 2013) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).
74. Expert Testimony (December 2013) on behalf of the Sierra Club in the matter of Public Service Company of New Hampshire Merrimack Station Scrubber Project and Cost Recovery, Docket No. DE 11-250, to the State of New Hampshire Public Utilities Commission.
75. Expert Report (January 2014) on behalf of Baja, Inc., in *Baja, Inc., v. Automotive Testing and Development Services, Inc. et. al*, Civil Action No. 8:13-CV-02057-GRA (District of South Carolina, Anderson/Greenwood Division).
76. Declaration (March 2014) on behalf of the Center for International Environmental Law, Chesapeake Climate Action Network, Friends of the Earth, Pacific Environment, and the Sierra Club (Plaintiffs) in the matter of *Plaintiffs v. the Export-Import Bank (Ex-Im Bank) of the United States*, Civil Action No. 13-1820 RC (District Court for the District of Columbia).

77. Declaration (April 2014) on behalf of Respondent-Intervenors in the matter of *Mexichem Specialty Resins Inc., et al., (Petitioners) v Environmental Protection Agency et al.*, Case No., 12-1260 (and Consolidated Case Nos. 12-1263, 12-1265, 12-1266, and 12-1267), (Court of Appeals, District of Columbia Circuit).
78. Direct Prefiled Testimony (June 2014) on behalf of the Michigan Environmental Council and the Sierra Club in the matter of the Application of DTE Electric Company for Authority to Implement a Power Supply Cost Recovery (PSCR) Plan in its Rate Schedules for 2014 Metered Jurisdictional Sales of Electricity, Case No. U-17319 (Michigan Public Service Commission).
79. Expert Report (June 2014) on behalf of ECM Biofilms in the matter of the US Federal Trade Commission (FTC) v. ECM Biofilms (FTC Docket #9358).
80. Direct Prefiled Testimony (August 2014) on behalf of the Michigan Environmental Council and the Sierra Club in the matter of the Application of Consumers Energy Company for Authority to Implement a Power Supply Cost Recovery (PSCR) Plan in its Rate Schedules for 2014 Metered Jurisdictional Sales of Electricity, Case No. U-17317 (Michigan Public Service Commission).
81. Declaration (July 2014) on behalf of Public Health Intervenors in the matter of *EME Homer City Generation v. US EPA* (Case No. 11-1302 and consolidated cases) relating to the lifting of the stay entered by the Court on December 30, 2011 (US Court of Appeals for the District of Columbia).
82. Expert Report (September 2014), Rebuttal Expert Report (December 2014) and Supplemental Expert Report (March 2015) on behalf of Plaintiffs in the matter of *Sierra Club and Montana Environmental Information Center (Plaintiffs) v. PPL Montana LLC, Avista Corporation, Puget Sound Energy, Portland General Electric Company, Northwestern Corporation, and PacifiCorp (Defendants)*, Civil Action No. CV 13-32-BLG-DLC-JCL (US District Court for the District of Montana, Billings Division).
83. Expert Report (November 2014) on behalf of Niagara County, the Town of Lewiston, and the Villages of Lewiston and Youngstown in the matter of CWM Chemical Services, LLC New York State Department of Environmental Conservation (NYSDEC) Permit Application Nos.: 9-2934-00022/00225, 9-2934-00022/00231, 9-2934-00022/00232, and 9-2934-00022/00249 (pending).
84. *Declaration (January 2015) relating to Startup/Shutdown in the MATS Rule (EPA Docket ID No. EPA-HQ-OAR-2009-0234) on behalf of the Environmental Integrity Project.*
85. Pre-filed Direct Testimony (March 2015), Supplemental Testimony (May 2015), and Surrebuttal Testimony (December 2015) on behalf of Friends of the Columbia Gorge in the matter of the Application for a Site Certificate for the Troutdale Energy Center before the Oregon Energy Facility Siting Council.
86. Brief of Amici Curiae Experts in Air Pollution Control and Air Quality Regulation in Support of the Respondents, On Writs of Certiorari to the US Court of Appeals for the District of Columbia, No. 14-46, 47, 48. *Michigan et. al., (Petitioners) v. EPA et. al., Utility Air Regulatory Group (Petitioners) v. EPA et. al., National Mining Association et. al., (Petitioner) v. EPA et. al.*, (Supreme Court of the United States).
87. Expert Report (March 2015) and Rebuttal Expert Report (January 2016) on behalf of Plaintiffs in the matter of *Conservation Law Foundation v. Broadrock Gas Services LLC, Rhode Island LFG GENCO LLC, and Rhode Island Resource Recovery Corporation (Defendants)*, Civil Action No. 1:13-cv-00777-M-PAS (US District Court for the District of Rhode Island).
88. Declaration (April 2015) relating to various Technical Corrections for the MATS Rule (EPA Docket ID No. EPA-HQ-OAR-2009-0234) on behalf of the Environmental Integrity Project.
89. Direct Prefiled Testimony (May 2015) on behalf of the Michigan Environmental Council, the Natural Resources Defense Council, and the Sierra Club in the matter of the Application of DTE Electric Company for Authority to Increase its Rates, Amend its Rate Schedules and Rules Governing the Distribution and Supply of Electric Energy and for Miscellaneous Accounting Authority, Case No. U-17767 (Michigan Public Service Commission).
90. Expert Report (July 2015) and Rebuttal Expert Report (July 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

91. Declaration (August 2015, Docket No. 1570376) in support of “Opposition of Respondent-Intervenors American Lung Association, et. al., to Tri-State Generation’s Emergency Motion;” Declaration (September 2015, Docket No. 1574820) in support of “Joint Motion of the State, Local Government, and Public Health Respondent-Intervenors for Remand Without Vacatur;” Declaration (October 2015) in support of “Joint Motion of the State, Local Government, and Public Health Respondent-Intervenors to State and Certain Industry Petitioners’ Motion to Govern, *White Stallion Energy Center, LLC v. US EPA*, Case No. 12-1100 (US Court of Appeals for the District of Columbia).
92. Declaration (September 2015) in support of the Draft Title V Permit for Dickerson Generating Station (Proposed Permit No 24-031-0019) on behalf of the Environmental Integrity Project.
93. Expert Report (Liability Phase) (December 2015) and Rebuttal Expert Report (February 2016) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., Environmental Law and Policy Center, and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).
94. Declaration (December 2015) in support of the Petition to Object to the Title V Permit for Morgantown Generating Station (Proposed Permit No 24-017-0014) on behalf of the Environmental Integrity Project.
95. Expert Report (November 2015) on behalf of Appellants in the matter of *Sierra Club, et al. v. Craig W. Butler, Director of Ohio Environmental Protection Agency et al.*, ERAC Case No. 14-256814.
96. Affidavit (January 2016) on behalf of Bridgewatch Detroit in the matter of *Bridgewatch Detroit v. Waterfront Petroleum Terminal Co., and Waterfront Terminal Holdings, LLC.*, in the Circuit Court for the County of Wayne, State of Michigan.
97. Expert Report (February 2016) and Rebuttal Expert Report (July 2016) on behalf of the challengers in the matter of the Delaware Riverkeeper Network, Clean Air Council, et. al., vs. Commonwealth of Pennsylvania Department of Environmental Protection and R. E. Gas Development LLC regarding the Geyer well site before the Pennsylvania Environmental Hearing Board.
98. Direct Testimony (May 2016) in the matter of Tesoro Savage LLC Vancouver Energy Distribution Terminal, Case No. 15-001 before the State of Washington Energy Facility Site Evaluation Council.
99. Declaration (June 2016) relating to deficiencies in air quality analysis for the proposed Millenium Bulk Terminal, Port of Longview, Washington.
100. Declaration (December 2016) relating to EPA’s refusal to set limits on PM emissions from coal-fired power plants that reflect pollution reductions achievable with fabric filters on behalf of Environmental Integrity Project, Clean Air Council, Chesapeake Climate Action Network, Downwinders at Risk represented by Earthjustice in the matter of *ARIPPA v EPA, Case No. 15-1180*. (D.C. Circuit Court of Appeals).
101. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Huntley and Huntley Poseidon Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
102. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Backus Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
103. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Drakulic Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
104. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Deutsch Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
105. Affidavit (February 2017) pertaining to deficiencies water discharge compliance issues at the Wood River Refinery in the matter of *People of the State of Illinois (Plaintiff) v. Phillips 66 Company, ConocoPhillips Company, WRB Refining LP (Defendants)*, Case No. 16-CH-656, (Circuit Court for the Third Judicial Circuit, Madison County, Illinois).

106. Expert Report (March 2017) on behalf of the Plaintiff pertaining to non-degradation analysis for waste water discharges from a power plant in the matter of *Sierra Club (Plaintiff) v. Pennsylvania Department of Environmental Protection (PADEP) and Lackawanna Energy Center*, Docket No. 2016-047-L (consolidated), (Pennsylvania Environmental Hearing Board).
107. Expert Report (March 2017) on behalf of the Plaintiff pertaining to air emissions from the Heritage incinerator in East Liverpool, Ohio in the matter of *Save our County (Plaintiff) v. Heritage Thermal Services, Inc. (Defendant)*, Case No. 4:16-CV-1544-BYP, (US District Court for the Northern District of Ohio, Eastern Division).
108. Rebuttal Expert Report (June 2017) on behalf of Plaintiffs in the matter of *Casey Voight and Julie Voight (Plaintiffs) v Coyote Creek Mining Company LLC (Defendant)*, Civil Action No. 1:15-CV-00109 (US District Court for the District of North Dakota, Western Division).
109. Expert Affidavit (August 2017) and Penalty/Remedy Expert Affidavit (October 2017) on behalf of Plaintiff in the matter of *Wildearth Guardians (Plaintiff) v Colorado Springs Utility Board (Defendant,)* Civil Action No. 1:15-cv-00357-CMA-CBS (US District Court for the District of Colorado).
110. Expert Report (August 2017) on behalf of Appellant in the matter of *Patricia Ann Troiano (Appellant) v. Upper Burrell Township Zoning Hearing Board (Appellee)*, Court of Common Pleas of Westmoreland County, Pennsylvania, Civil Division.
111. Expert Report (October 2017), Supplemental Expert Report (October 2017), and Rebuttal Expert Report (November 2017) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).
112. Declaration (December 2017) on behalf of the Environmental Integrity Project in the matter of permit issuance for ATI Flat Rolled Products Holdings, Breckenridge, PA to the Allegheny County Health Department.
113. Expert Report (Harm Phase) (January 2018) and Rebuttal Expert Report (Harm Phase) (May 2018) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).
114. Declaration (February 2018) on behalf of the Chesapeake Bay Foundation, et. al., in the matter of the Section 126 Petition filed by the state of Maryland in *State of Maryland v. Pruitt (Defendant)*, Civil Action No. JKB-17-2939 (Consolidated with No. JKB-17-2873) (US District Court for the District of Maryland).
115. Direct Pre-filed Testimony (March 2018) on behalf of the National Parks Conservation Association (NPCA) in the matter of *NPCA v State of Washington, Department of Ecology and BP West Coast Products, LLC*, PCHB No. 17-055 (Pollution Control Hearings Board for the State of Washington).
116. Expert Affidavit (April 2018) and Second Expert Affidavit (May 2018) on behalf of Petitioners in the matter of *Coosa River Basin Initiative and Sierra Club (Petitioners) v State of Georgia Environmental Protection Division, Georgia Department of Natural Resources (Respondent) and Georgia Power Company (Intervenor/Respondent)*, Docket Nos: 1825406-BNR-WW-57-Howells and 1826761-BNR-WW-57-Howells, Office of State Administrative Hearings, State of Georgia.

C. Occasions where Dr. Sahu has provided oral testimony in depositions, at trial or in similar proceedings include the following:

117. Deposition on behalf of Rocky Mountain Steel Mills, Inc. located in Pueblo, Colorado – dealing with the manufacture of steel in mini-mills including methods of air pollution control and BACT in steel mini-mills and opacity issues at this steel mini-mill.
118. Trial Testimony (February 2002) on behalf of Rocky Mountain Steel Mills, Inc. in Denver District Court.

119. Trial Testimony (February 2003) on behalf of the United States in the Ohio Edison NSR Cases, *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (Southern District of Ohio).
120. Trial Testimony (June 2003) on behalf of the United States in the Illinois Power NSR Case, *United States v. Illinois Power Co., et al.*, 99-833-MJR (Southern District of Illinois).
121. Deposition (10/20/2005) on behalf of the United States in connection with the Cinergy NSR Case. *United States, et al. v. Cinergy Corp., et al.*, IP 99-1693-C-M/S (Southern District of Indiana).
122. Oral Testimony (August 2006) on behalf of the Appalachian Center for the Economy and the Environment re. the Western Greenbrier plant, WV before the West Virginia DEP.
123. Oral Testimony (May 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) re. the Thompson River Cogeneration plant before the Montana Board of Environmental Review.
124. Oral Testimony (October 2007) on behalf of the Sierra Club re. the Sevier Power Plant before the Utah Air Quality Board.
125. Oral Testimony (August 2008) on behalf of the Sierra Club and Clean Water re. Big Stone Unit II before the South Dakota Board of Minerals and the Environment.
126. Oral Testimony (February 2009) on behalf of the Sierra Club and the Southern Environmental Law Center re. Santee Cooper Pee Dee units before the South Carolina Board of Health and Environmental Control.
127. Oral Testimony (February 2009) on behalf of the Sierra Club and the Environmental Integrity Project re. NRG Limestone Unit 3 before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.
128. Deposition (July 2009) on behalf of MTD Products, Inc., in the matter of *Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al.*
129. Deposition (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed Coletto Creek coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).
130. Deposition (October 2009) on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).
131. Deposition (October 2009) on behalf of the Sierra Club, in the matter of challenges to the proposed Medicine Bow Fuel and Power IGL plant in Cheyenne, Wyoming.
132. Deposition (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed Tenaska coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH). (April 2010).
133. Oral Testimony (November 2009) on behalf of the Environmental Defense Fund re. the Las Brisas Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.
134. Deposition (December 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed White Stallion Energy Center coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).
135. Oral Testimony (February 2010) on behalf of the Environmental Defense Fund re. the White Stallion Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.
136. Deposition (June 2010) on behalf of the United States in connection with the Alabama Power Company NSR Case. *United States v. Alabama Power Company*, CV-01-HS-152-S (Northern District of Alabama, Southern Division).
137. Trial Testimony (September 2010) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, State of Maryland, and State of New Jersey (Plaintiffs)

- in connection with the Allegheny Energy NSR Case in US District Court in the Western District of Pennsylvania. *Plaintiffs v. Allegheny Energy Inc., et al.*, 2:05cv0885 (Western District of Pennsylvania).
138. Oral Direct and Rebuttal Testimony (September 2010) on behalf of Fall-Line Alliance for a Clean Environment and others in the matter of the PSD Air Permit for Plant Washington issued by Georgia DNR at the Office of State Administrative Hearing, State of Georgia (OSAH-BNR-AQ-1031707-98-WALKER).
 139. Oral Testimony (September 2010) on behalf of the State of New Mexico Environment Department in the matter of Proposed Regulation 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions*, No. EIB 10-04 (R), to the State of New Mexico, Environmental Improvement Board.
 140. Oral Testimony (October 2010) on behalf of the Environmental Defense Fund re. the Las Brisas Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.
 141. Oral Testimony (November 2010) regarding BART for PSCo Hayden, CSU Martin Drake units before the Colorado Air Quality Commission on behalf of the Coalition of Environmental Organizations.
 142. Oral Testimony (December 2010) regarding BART for TriState Craig Units, CSU Nixon Unit, and PRPA Rawhide Unit) before the Colorado Air Quality Commission on behalf of the Coalition of Environmental Organizations.
 143. Deposition (December 2010) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana).
 144. Deposition (February 2011 and January 2012) on behalf of Wild Earth Guardians in the matter of opacity exceedances and monitor downtime at the Public Service Company of Colorado (Xcel)’s Cherokee power plant. No. 09-cv-1862 (D. Colo.).
 145. Oral Testimony (February 2011) to the Georgia Office of State Administrative Hearings (OSAH) in the matter of Minor Source HAPs status for the proposed Longleaf Energy Associates power plant (OSAH-BNR-AQ-1115157-60-HOWELLS) on behalf of the Friends of the Chattahoochee and the Sierra Club).
 146. Deposition (August 2011) on behalf of the United States in *United States of America v. Cemex, Inc.*, Civil Action No. 09-cv-00019-MSK-MEH (District of Colorado).
 147. Deposition (July 2011) and Oral Testimony at Hearing (February 2012) on behalf of the Plaintiffs MYTAPN in the matter of Microsoft-Yes, Toxic Air Pollution-No (MYTAPN) v. State of Washington, Department of Ecology and Microsoft Corporation Columbia Data Center to the Pollution Control Hearings Board, State of Washington, Matter No. PCHB No. 10-162.
 148. Oral Testimony at Hearing (March 2012) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana).
 149. Oral Testimony at Hearing (April 2012) on behalf of the New Hampshire Sierra Club at the State of New Hampshire Public Utilities Commission, Docket No. 10-261 – the 2010 Least Cost Integrated Resource Plan (LCIRP) submitted by the Public Service Company of New Hampshire (re. Merrimack Station Units 1 and 2).
 150. Oral Testimony at Hearing (November 2012) on behalf of Clean Wisconsin in the matter of Application of Wisconsin Public Service Corporation for Authority to Construct and Place in Operation a New Multi-Pollutant Control Technology System (ReACT) for Unit 3 of the Weston Generating Station, before the Public Service Commission of Wisconsin, Docket No. 6690-CE-197.
 151. Deposition (March 2013) in the matter of various Environmental Petitioners v. North Carolina DENR/DAQ and Carolinas Cement Company, before the Office of Administrative Hearings, State of North Carolina.
 152. Deposition (August 2013) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).
 153. Deposition (August 2013) on behalf of the Sierra Club in connection with the Luminant Martin Lake Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 5:10-cv-0156-MHS-CMC (Eastern District of Texas, Texarkana Division).

154. Deposition (February 2014) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).
155. Trial Testimony (February 2014) in the matter of *Environment Texas Citizen Lobby, Inc and Sierra Club v. ExxonMobil Corporation et al.*, Civil Action No. 4:10-cv-4969 (Southern District of Texas, Houston Division).
156. Trial Testimony (February 2014) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).
157. Deposition (June 2014) and Trial (August 2014) on behalf of ECM Biofilms in the matter of the *US Federal Trade Commission (FTC) v. ECM Biofilms* (FTC Docket #9358).
158. Deposition (February 2015) on behalf of Plaintiffs in the matter of *Sierra Club and Montana Environmental Information Center (Plaintiffs) v. PPL Montana LLC, Avista Corporation, Puget Sound Energy, Portland General Electric Company, Northwestern Corporation, and PacifiCorp (Defendants)*, Civil Action No. CV 13-32-BLG-DLC-JCL (US District Court for the District of Montana, Billings Division).
159. Oral Testimony at Hearing (April 2015) on behalf of Niagara County, the Town of Lewiston, and the Villages of Lewiston and Youngstown in the matter of CWM Chemical Services, LLC New York State Department of Environmental Conservation (NYSDEC) Permit Application Nos.: 9-2934-00022/00225, 9-2934-00022/00231, 9-2934-00022/00232, and 9-2934-00022/00249 (pending).
160. Deposition (August 2015) on behalf of Plaintiff in the matter of *Conservation Law Foundation (Plaintiff) v. Broadrock Gas Services LLC, Rhode Island LFG GENCO LLC, and Rhode Island Resource Recovery Corporation (Defendants)*, Civil Action No. 1:13-cv-00777-M-PAS (US District Court for the District of Rhode Island).
161. Testimony at Hearing (August 2015) on behalf of the Sierra Club in the matter of *Amendments to 35 Illinois Administrative Code Parts 214, 217, and 225* before the Illinois Pollution Control Board, R15-21.
162. Deposition (May 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., (Plaintiffs) v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).
163. Trial Testimony (October 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., (Plaintiffs) v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).
164. Deposition (April 2016) on behalf of the Plaintiffs in *UNatural Resources Defense Council, Respiratory Health Association, and Sierra Club (Plaintiffs) v. Illinois Power Resources LLC and Illinois Power Resources Generation LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (Central District of Illinois, Peoria Division).
165. Trial Testimony at Hearing (July 2016) in the matter of Tesoro Savage LLC Vancouver Energy Distribution Terminal, Case No. 15-001 before the State of Washington Energy Facility Site Evaluation Council.
166. Trial Testimony (December 2016) on behalf of the challengers in the matter of the Delaware Riverkeeper Network, Clean Air Council, et. al., vs. Commonwealth of Pennsylvania Department of Environmental Protection and R. E. Gas Development LLC regarding the Geyer well site before the Pennsylvania Environmental Hearing Board.
167. Trial Testimony (July-August 2016) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).
168. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Huntley and Huntley Poseidon Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

169. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Backus Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
170. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Drakulic Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
171. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Deutsch Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
172. Deposition Testimony (July 2017) on behalf of Plaintiffs in the matter of *Casey Voight and Julie Voight v Coyote Creek Mining Company LLC (Defendant)* Civil Action No. 1:15-CV-00109 (US District Court for the District of North Dakota, Western Division).
173. Deposition Testimony (November 2017) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).
174. Deposition Testimony (December 2017) on behalf of Plaintiff in the matter of *Wildearth Guardians (Plaintiff) v Colorado Springs Utility Board (Defendant)* Civil Action No. 1:15-cv-00357-CMA-CBS (US District Court for the District of Colorado).
175. Deposition Testimony (January 2018) in the matter of National Parks Conservation Association (NPCA) v. State of Washington Department of Ecology and British Petroleum (BP) before the Washington Pollution Control Hearing Board, Case No. 17-055.
176. Trial Testimony (January 2018) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).
177. Trial Testimony (April 2018) on behalf of the National Parks Conservation Association (NPCA) in the matter of NPCA v State of Washington, Department of Ecology and BP West Coast Products, LLC, PCHB No. 17-055 (Pollution Control Hearings Board for the State of Washington).









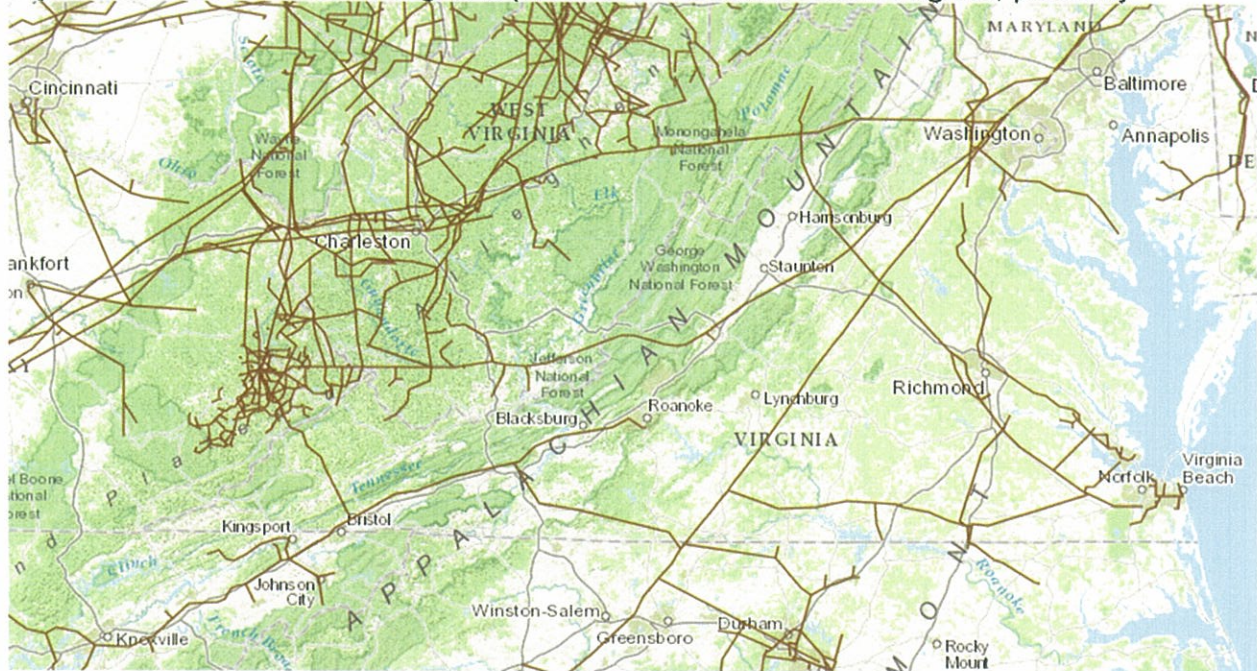
<http://www.virginiaplaces.org/transportation/gaspipeline.html>

Natural Gas Pipelines in Virginia

natural gas pipelines bring natural gas from the Gulf Coast and West Virginia/Ohio/Pennsylvania into Virginia

Source: ESRI, [ArcGIS Online](#)

Virginia imports over 50% of its natural gas via pipeline from out-of-state sources. A significant amount of natural gas is produced in southwestern Virginia, primarily



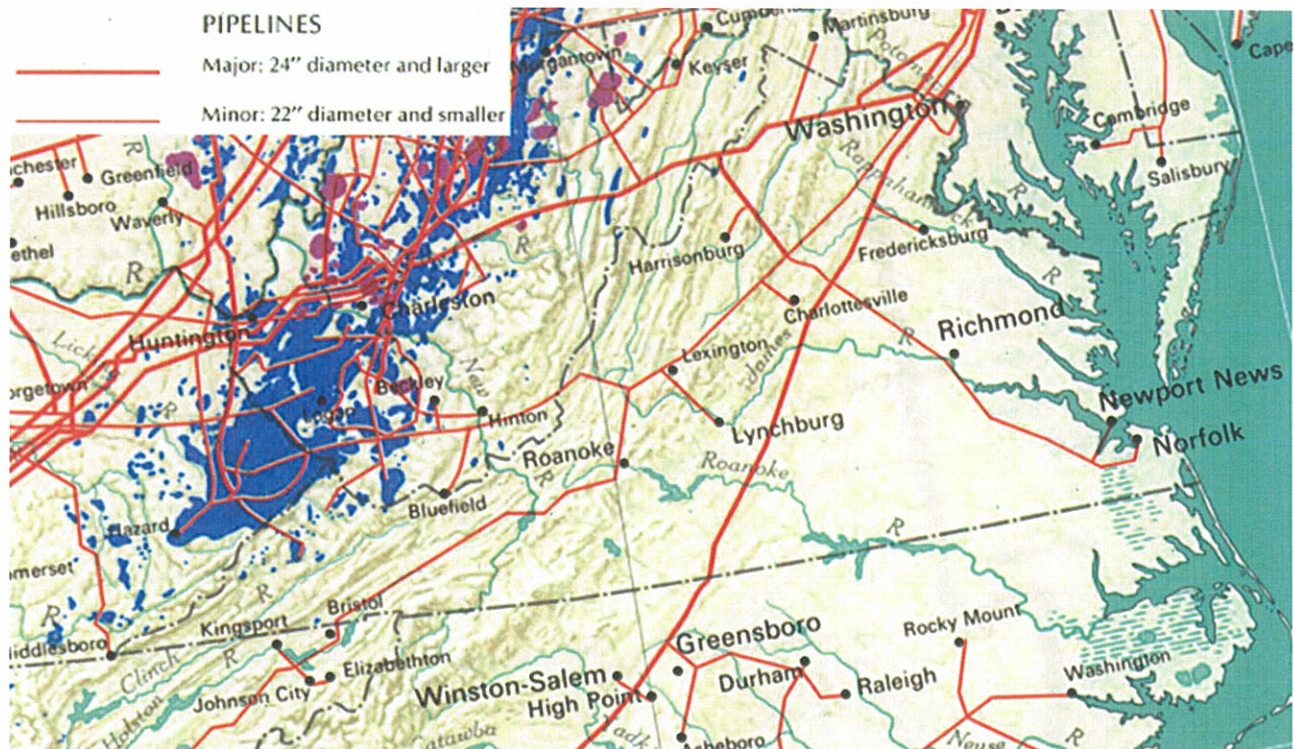
methane from coal beds in the Appalachian Plateau. A tiny amount of methane is captured at landfills and even at wastewater treatment plants. In production, transport, and storage, some natural gas escapes and increases greenhouse gases in the atmosphere.

In Virginia, two commercial oil fields produce natural gas as well as fluids. When natural gas is brought to the surface and the pressure is lowered, some hydrocarbon molecules condense from their gaseous state into liquid. Oil fields produce some gas, and gas fields produce some oil.

The condensates (natural gas liquids) extracted from the Marcellus Shale gas in West Virginia/Ohio provide raw material for refineries around Pittsburgh and Philadelphia. The natural gas produced from the Appalachian fields provides energy for refinery operations, but much is now shipped by pipeline to customers on the East Coast. Distribution by pipeline in the area has a long history. The first hydrocarbon pipelines in the United States were developed in western Pennsylvania, after Colonel Edwin Drake drilled the first oil well at Titusville in 1859.

new pipeline along the eastern side of the mountains, Transco had an advantage - it had no existing customers. Transco signed contracts with some customers in Virginia such as Danville, but reserved enough volume so Transco could become the dominant supplier in New York and earn higher profits.³

The Transco pipeline today is owned by Williams Companies. It is still the primary trunk pipeline that carries natural gas from the Gulf of Mexico and adjacent states to Virginia, but the direction of flow is being reversed.

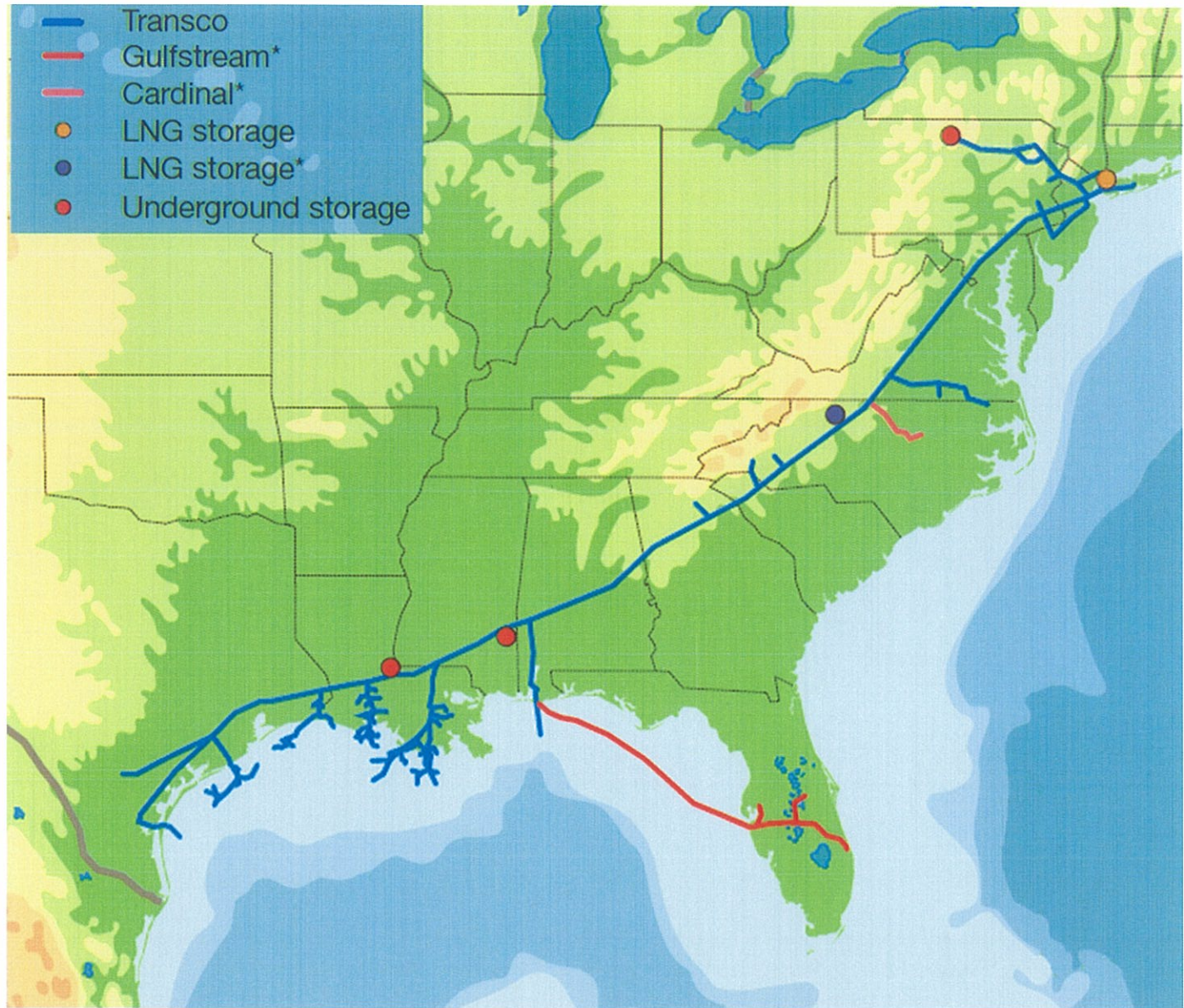


much of Southside Virginia had no large pipeline providing natural gas in 1970, limiting the region's ability to recruit new manufacturing facilities

Source: Library of Congress, "The national atlas of the United States of America," [Natural Gas Pipelines](#)

After development of the Ohio, Marcellus, and Utica shale gas fields through fracking, that pipeline can now bring gas from West Virginia, Ohio, and Pennsylvania south to Virginia. The company will expand pipeline capacity across Pennsylvania (the Atlantic Sunrise Project) and push gas in the main pipeline towards the south. The company's proposed Appalachian Connector project would provide a new link bringing Appalachian gas to the existing Transco pipeline in Virginia, joining at the Transco Station 165 compressor station in Pittsylvania County.

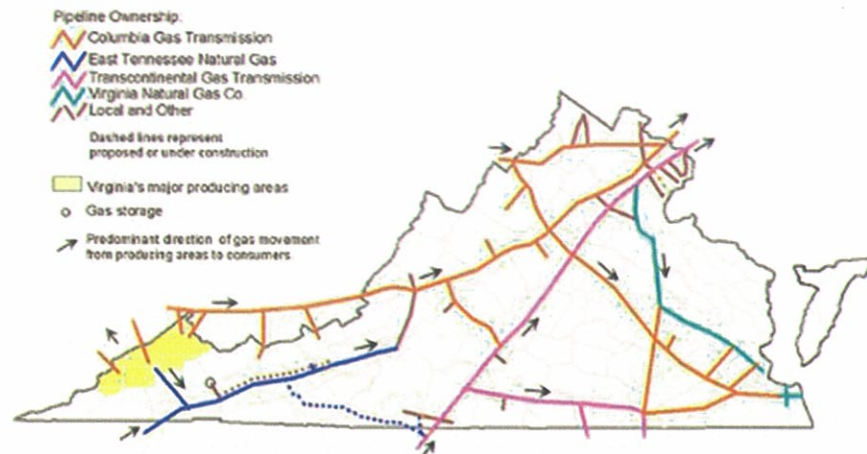
Two other companies, Enbridge (which acquired Spectra in 2017) and Columbia Gas (now part of NiSource), own the other two major *interstate* pipelines bringing natural gas into Virginia. Both of those trunk lines bring Gulf Coast and Appalachian gas eastward into Virginia. In 1950, the Roanoke Gas Company built a 30-mile pipeline to Gala in



the first Transco natural gas pipeline connected the Gulf Coast with the Northeast, but now can bring gas from Pennsylvania/Ohio south to Virginia

Source: Williams Company, [Gas Pipeline Asset Map](#)

In addition to Transco (Williams) and the East Tennessee Natural Gas pipeline (Spectra Energy), Virginia receives large supplies of natural gas from two other interstate pipeline companies. Columbia Gas Transmission has two major pipelines that cross into Virginia from its western border to supply both Northern Virginia and Hampton Roads.



Transco, Spectra and Columbia Gas own the major interstate trunk pipelines bringing natural gas to Virginia

Source: 2010 Virginia Energy Plan, [Section 5 - Natural Gas](#)

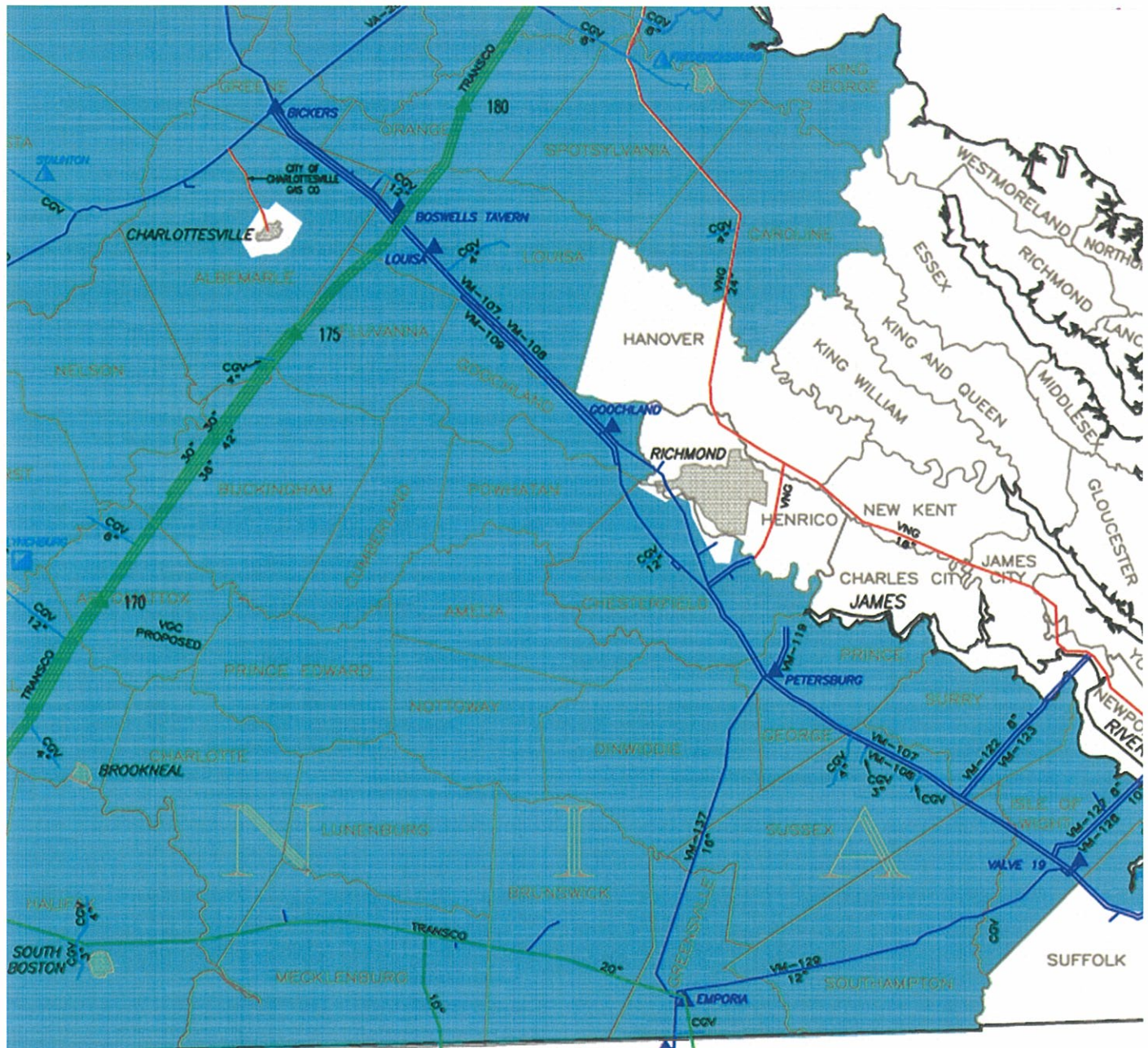
Dominion Transmission, a subsidiary of the same company that dominates the electricity market in Virginia, built a pipeline to carry natural gas from Maryland to the Possum Point electricity generating plant in Prince William County. That pipeline was planned to carry gas from the Cove Point Liquefied Natural Gas (LNG) terminal in Maryland to Possum Point.

After the success of fracking in the Appalachian Basin, Dominion decided to reconfigure the Cove Point terminal to export, rather than import, Liquefied Natural Gas. The primary supply for Possum Point became gas from Appalachian shale basins, delivered via pipeline from Pennsylvania, Ohio, and West Virginia. In 2018, Dominion planned to add a third compressor station to the pipeline to increase its capacity.

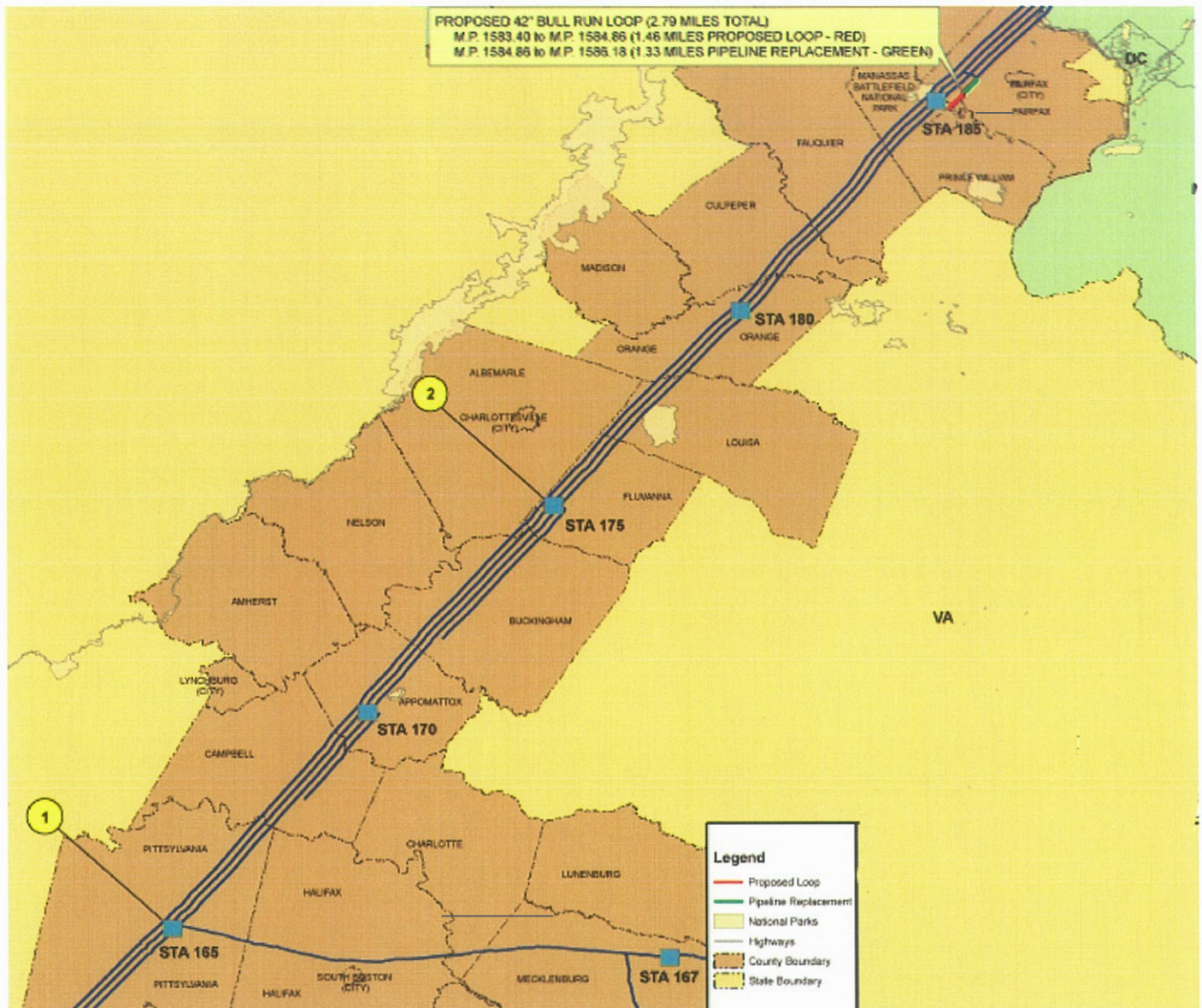
The initial site planned for the compressor station was in Charles County, Maryland, across the Potomac River from Mount Vernon. The historical view from George Washington's home would be affected if the two exhaust stacks were visible. Piscataway Park had been created to protect that view in the 1960's, when sewage treatment plants and oil storage facilities were proposed near the Maryland shoreline.

Though Dominion claimed the stacks would be screened by trees, the company later agreed to find another location.⁵

The exclusive service areas are easy to see when examining maps of service areas in Tidewater Virginia for Virginia Natural Gas (a subsidiary of Southern Company) and Columbia Gas of Virginia (a subsidiary of NiSource), especially in the cities of Suffolk, Chesapeake, and Virginia Beach in Hampton Roads:



Columbia Gas distribution service area
Source: [Columbia Gas of Virginia](#)



Transco natural gas pipeline route through a portion of Virginia
 (replacement pipe through Manassas Battlefield was installed in 2012, after Civil War
 Sesquicentennial events had concluded)

Source: Transcontinental Gas Pipe Line Company, [Mid-Atlantic Connector Expansion Project](#)

[From Feet to Space: Transportation in Virginia](#)
[Energy in Virginia](#)
[Virginia Places](#)

H. Andrew Gray
Gray Sky Solutions

TOTAL ANNUAL NITROGEN DEPOSITION (kg/yr)

FACILITY	UNIT	WATERSHED	BAY	VIRGINIA	MARYLAND	PENNSYLVANIA	PAMUNKEY	DRAGON RUN	DISMAL SWP
MARTS	ALL 6 UNITS	1104.60	14.45	506.94	162.42	844.19	20.828	1.175	0.798
BUCKINGHAM	ALL 19 UNITS	2539.40	27.51	2472.90	175.53	370.81	106.320	2.624	1.404
NORTHAMPTON	ALL 5 UNITS	359.40	24.91	603.51	66.89	83.52	20.007	2.573	4.238
CRAYNE	1 UNIT	256.00	3.50	71.88	40.45	541.88	3.211	0.230	0.143
TONKIN	ALL 4 UNITS	774.02	8.74	155.22	96.00	1756.60	7.508	0.556	0.335
MOCKINGBIRD	ALL 4 UNITS	1070.00	14.72	398.90	165.42	1550.00	19.144	1.128	0.714
3 New Facilities	30 UNITS	4003.40	66.87	3583.35	404.84	1298.52	147.155	6.371	6.440
All 6 Facilities	39 UNITS	6103.42	93.82	4209.35	706.70	5147.00	177.017	8.284	7.631

FACILITY	UNIT	ROANOKE	HOLSTON	BLACKWATER	NOTTOWAY	JAMES RIVER	MOSHANNON	TIOGA	BEAVER RUN
MARTS	ALL 6 UNITS	58.490	0.905	4.949	13.256	166.860	8.859	7.716	4.195
BUCKINGHAM	ALL 19 UNITS	344.410	0.513	13.299	61.002	1506.300	4.607	6.102	0.962
NORTHAMPTON	ALL 5 UNITS	53.611	0.096	47.095	134.310	123.370	1.011	1.273	0.176
CRAYNE	1 UNIT	9.035	0.108	0.829	1.940	22.061	4.397	2.954	4.771
TONKIN	ALL 4 UNITS	21.882	0.190	2.072	5.459	43.430	21.330	10.287	120.920
MOCKINGBIRD	ALL 4 UNITS	49.781	0.739	4.846	12.201	123.160	13.437	11.385	9.329
3 New Facilities	30 UNITS	456.511	1.514	65.343	208.568	1796.530	14.477	15.091	5.333
All 6 Facilities	39 UNITS	537.209	2.552	73.090	228.168	1985.181	53.640	39.716	140.352

IN THE MATTER
Of the Proposed Buckingham Compressor Station

Report of
George Thurston Sc.D.
Chester, NY 10918

September 9, 2018

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Report of George Thurston, Sc.D.

A. Qualifications

I am George D. Thurston, Sc.D. I am a Professor at the New York University School of Medicine in the Department of Environmental Medicine. My business address is: Three Catherine Ct., Chester, NY 10918. I am providing expert testimony that addresses the public health impacts of emissions of fine particulate matter (PM_{2.5}) generally and, specifically, the expected public health impacts of PM_{2.5} emissions from the proposed Buckingham Compressor Station (BCS). My testimony will address the potential health effects of the facility, if approved. I conclude that the that the air pollution emissions from this facility can be expected to increase adverse health risks in the surrounding community.

I received my undergraduate degree in Engineering from Brown University (with a Concentration in Environmental Engineering) in 1974, and my doctorate in Environmental Health Sciences from the Harvard University School of Public Health in 1983. I was Chairman of the Health and Environment Panel of the Canadian Joint Industry/Government Study of Sulfur in Gasoline and Diesel Fuels in 1997. I also served on the National Academy of Science's Committee on the Health Effects of Incineration from January 1995 through November 1999, and am presently serving as the Chair of the Environmental Health Policy Committee of the American Thoracic Society. I have published extensively regarding the health effects of inhaled air pollutants on humans, particularly as it relates to asthma attacks, hospital admissions, and mortality. I have been called upon by both the U.S. House of Representatives and the U.S. Senate on multiple occasions over the years to provide testimony before them regarding the human health effects of air pollution. I have also been a contributing author to both the 1996 and 2001 EPA Particulate Matter ("PM") Criteria Documents, which the EPA uses as a scientific basis for its decisions regarding the setting of the nation's PM ambient air quality standards. More recently, I served on the U.S. EPA's Clean Air Science Advisory Committee (CASC) on the human health effects of Nitrogen Oxides and Sulfur Oxides. I was a Principal Investigator of a study that has shown that long-term exposure to combustion-related fine particulate air pollution is an important environmental risk factor for cardiopulmonary and lung cancer mortality in the US. (See Pope, CA, 3rd; Burnett, RT; Thun, MJ; Calle, EE; Krewski, D; Ito, K; and; Thurston, GA. (2002). Lung Cancer, Cardiopulmonary Mortality, and Long-term Exposure to Fine Particulate Air Pollution. JAMA 2002; 287: 1132-

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1141. The publications reviewed or relied upon for this testimony are listed at the end of this report as "Literature Cited."

In the past, I have provided testimony about the human health impacts of air pollution from fossil fuel combustion sources on numerous occasions, and on the health effects of natural gas combustion-related pollution specifically, including in the Issues Conference in Case 00-F-1256, in the Matter of the Application of Calpine Construction Finance Company, L.L.P. (2001) and on the application by TransGas Energy Systems LLC for a Certificate of Environmental Compatibility and Public Need to Construct and Operate a 1,100 Megawatt Combined Cycle Generating Facility (2003).

B. The State of the Science Regarding Particulate Matter (PM) Air Pollution and its Human Health Effects

The adverse health consequences of breathing air pollution that results from sources such as fossil fuel combustion facilities are well documented in the published medical and scientific literature. During the past decades, medical research examining air pollution and public health has shown that air pollution is associated with a host of serious adverse human health effects. This documentation includes impacts revealed by observational epidemiology, and confirmed by controlled chamber exposures, showing consistent associations between air pollution and adverse impacts across a wide range of human health outcomes.

Observational epidemiology studies provide the most compelling and consistent evidence of the adverse effects of air pollution. "Epidemiology" is literally "the study of epidemics", but includes all statistical investigations of human health and potentially causal factors of good or ill health. In the case of air pollution, such studies follow people as they undergo varying real-life exposures to pollution over time, or from one place to another, and then statistically inter-compare the health impacts that occur in these populations when higher (versus lower) exposures to pollution are experienced. In such studies, risks are often reported in terms of a Relative Risk (RR) of illness, wherein a $RR = 1.0$ is an indication of no change in risk after exposure, while a $RR > 1.0$ indicates an increase in health problems after pollution exposure, and that air pollution is damaging to health.

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These epidemiological investigations are of two types: 1) population-based studies, in which an entire city's population might be considered in the analysis; and 2) cohort studies, in which selected individuals, such as a group of asthmatics, are considered. Both of these types of epidemiologic studies have shown confirmatory associations between air pollution exposures and increasing numbers of adverse impacts, including:

- decreased lung function (a measure of our ability to breathe freely);
- more frequent asthma symptoms;
- increased numbers of asthma and heart attacks;
- more frequent emergency department visits;
- additional hospital admissions; and
- increased numbers of deaths.

The fact that the effects of air pollution have been shown so consistently for so many health endpoints and in so many locales indicates these associations to be causal.

In addition to lung damage, recent epidemiological and toxicological studies of PM_{2.5} air pollution have shown adverse effects on the heart, including an increased risk of heart attacks. For example, when PM stresses the lung (*e.g.*, by inducing edema), it places extra burden on the heart, which can induce fatal complications for persons with cardiac problems. Indeed, for example, Peters *et al.* (2001) found that elevated concentrations of fine particles in the air can elevate the risk of Myocardial Infarctions (MI's) within a few hours, and extending 1 day after PM exposure. The Harvard University team found that a 48 percent increase in the risk of MI was associated with an increase of 25 $\mu\text{g}/\text{m}^3$ PM_{2.5} during a 2-hour period before the onset of MI, and a 69 percent increase in risk to be related to an increase of 20 $\mu\text{g}/\text{m}^3$ PM_{2.5} in the 24-hour average 1 day before the MI onset (Peters *et al.*, 2001). Numerous other U.S. studies have also show qualitatively consistent acute cardiac effects, such as the Zanobetti and Schwartz (2006) study of hospital admissions through emergency department for myocardial infarction (ICD-9 code, and Zanobetti *et al.* (2009) that examined the relationship between daily PM_{2.5} concentrations and emergency hospital admissions for

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cardiovascular causes, myocardial infarction, and congestive heart failure in 26 U.S. communities during 2000-2003.

Cardiac effects at the biological level have also been documented in both animal and human studies. Animal experiments at Harvard University by Godleski *et al.* (1996, 2000) indicate that exposures to elevated concentrations of ambient particulate matter can result in cardiac related problems in dogs that had been pre-treated (in order to try to simulate sensitive individuals) to induce coronary occlusion (i.e., narrowed arteries in the heart) before exposing them to air pollution. The most biologically and clinically significant finding was that, in these dogs, the particulate affected one of the major electrocardiogram (ECG) markers of heart attacks (myocardial ischemia) in humans, known as elevation of the ST segment. Cardiac effects at the biological level have been found in human studies, as well. For example, Pope *et al.* (1999) and Gold *et al.* (2000) found that PM exposure is associated with changes in human heart rate variability. Such changes in heart rate variability (HRV) may reflect changes in cardiac autonomic function and risk of sudden cardiac death. In the Pope *et al.* study, repeated ambulatory ECG monitoring was conducted on 7 subjects for a total of 29 person-days before, during, and after episodes of elevated pollution. After controlling for differences across patients, elevated particulate levels were found to be associated with (1) increased mean heart rate, (2) decreased SDNN, a measure of overall HRV, (3) decreased SDANN, a measure that corresponds to ultra-low frequency variability, and (4) increased r-MSSD, a measure that corresponds to high-frequency variability. This confirms, at the individual level, that biological changes do occur in heart function as a result of PM exposure, supporting the biological plausibility of the epidemiological associations between PM exposure and cardiac illnesses.

Epidemiologic research conducted on U.S. residents has indicated that acute short-term exposures to PM air pollution, are associated with increased risk of mortality. For example, a nationwide time-series statistical analysis of daily death counts by the Health Effects Institute (HEI, 2003) examined mortality and PM₁₀ air pollution (a subset of particulate matter air pollution that is less than 10 μm in diameter, including PM_{2.5}) in 90 cities across the United States, finding that, for each increase of 10 $\mu\text{g}/\text{m}^3$ in daily PM₁₀ air pollution concentration, there is an associated increase of approximately 0.3% in the *daily* risk of death by the public. Indeed, and I concur, the most recent U.S. EPA Particulate Matter

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Integrated Science Assessment (ISA) (USEPA, 2009a) unequivocally states that “Together, the collective evidence from epidemiologic, controlled human exposure, and toxicological studies is sufficient to conclude that *a causal relationship exists between short term exposures to PM_{2.5} and cardiovascular effects . . . and mortality.*”¹

With respect to PM_{2.5} from fossil fuel combustion, my recent study also found that long-term exposure to combustion-related fine particulate air pollution is an important environmental risk factor for cardiopulmonary and lung cancer mortality. Moreover, long-term exposure to fine particles increases the risk of death, and has been estimated to take more than a year from the life expectancy of people living in the most polluted cities, relative to those living in cleaner cities. For example, Brunekreef (1997) reviewed the available evidence of the mortality effects of long-term exposure to PM air pollution and, using life table methods, derived an estimate of the reduction in life expectancy implied by those effect estimates. Based on the results of Pope et al. (1995) and Dockery et al. (1993), a relative risk of 1.1 per 10 ug/m³ exposure over 15 years was assumed for the effect of fine PM air pollution on men 25-75 years of age. A 1992 life table for men in the Netherlands was developed for 10 successive five-year categories that make up the 25-75 year old age range. Life expectancy of a 25 year old was then calculated for this base case and compared with the calculated life expectancy for the PM exposed case where the death rates were increased in each age group by a factor of 1.1. A difference of 1.11 years was found between the “exposed” and “clean air” cohorts’ overall life expectancy at age 25. A similar calculation by the authors for the 1969-71 life table for U.S. white males yielded an even larger reduction of 1.31 years for the entire population’s life expectancy at age 25. Thus, these calculations indicate that differences in long-term exposure to ambient PM_{2.5} can have substantial effects on life expectancy.

In addition to the acute health effects associated with daily PM pollution, long-term exposure to fine PM is also associated with increased lifetime risk of death and has been estimated to take years from the life expectancy of people living in the most polluted cities, relative to those living in cleaner cities. For example, in the Six-Cities Study (that was a key basis for the setting of the original PM_{2.5} annual standard in 1997), Dockery *et al.* (1993) analyzed survival probabilities among 8,111 adults living in six cities in the central and eastern

¹ U.S. Environmental Protection Agency (2009a)

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portions of the United States during the 1970's and 80's. The cities were: Portage, WI (P); Topeka, KS (T); a section of St. Louis, MO (L); Steubenville, OH (S); Watertown, MA (M); and Kingston-Harriman, TN (K). Air quality was averaged over the period of study in order to study long-term (chronic) effects. As shown in Figure 1, it was found that the long-term risk of death, relative to the cleanest city, increased with fine particle exposure, even after correcting for potentially confounding factors such as age, sex, race, smoking, etc.

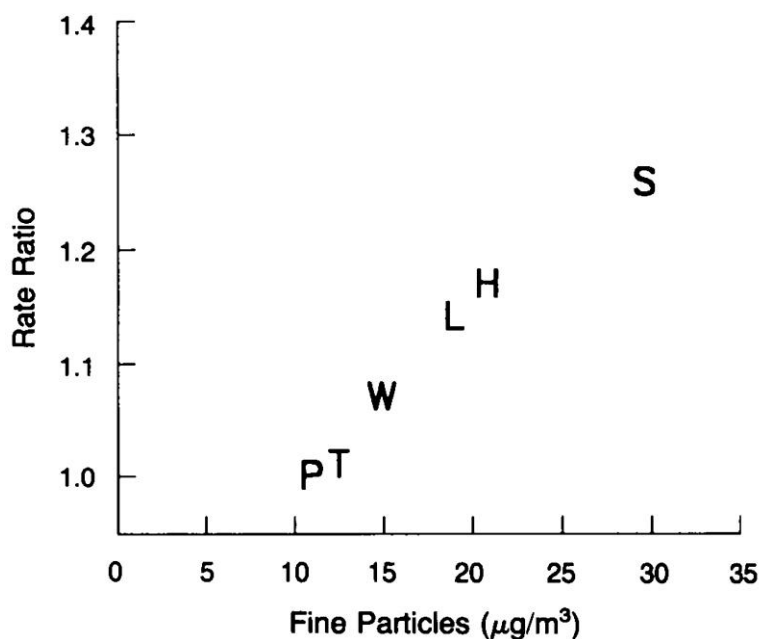


Figure 1. The Harvard Six-Cities Study showed that the lifetime risk of death increased across 6 U.S. cities as the average fine PM levels increased. (Source: Dockery *et al.*, 1993).

Moreover, a study that I and co-authors published in the Journal of the American Medical Association (JAMA), shows that long-term exposure to combustion-related fine particulate air pollution is an important environmental risk factor for cardiopulmonary and lung cancer mortality. Indeed, as shown in Figure 2, this study indicates that the increase in risk of lung cancer from long-term exposure to PM_{2.5} in a polluted city was of roughly the same size as the increase in lung cancer risk of a non-smoker who breathes passive smoke while living with a smoker, or about a 20% increase in lung cancer risk (*see Pope, CA, et al.*, 2002).

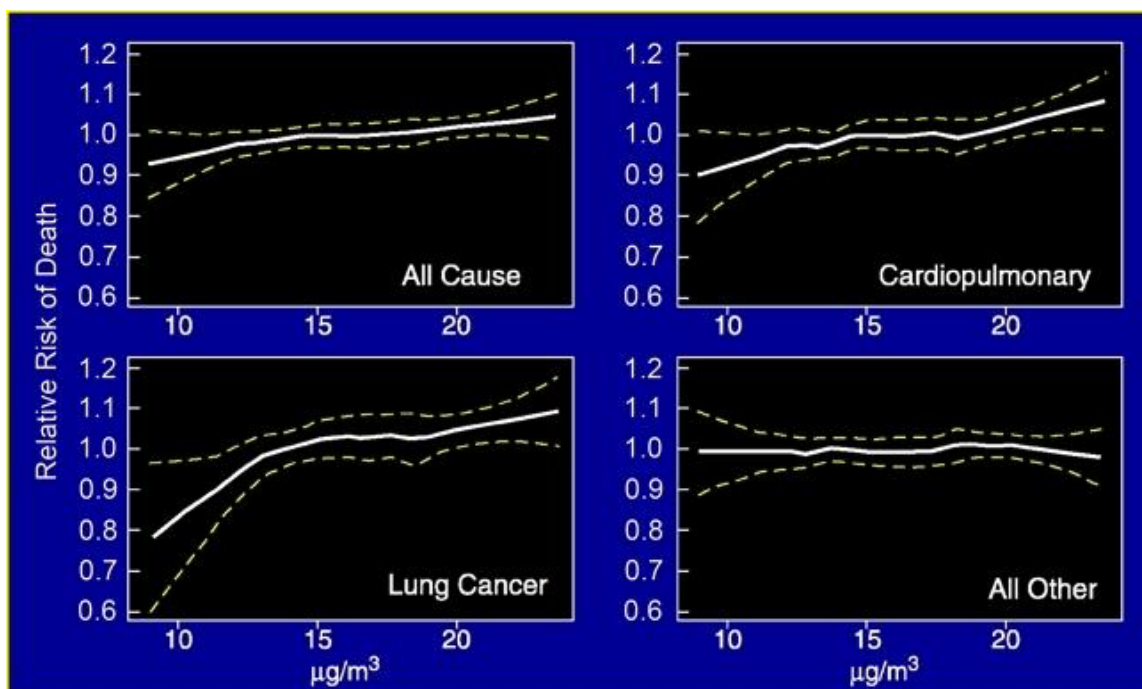


Figure 2. Cardiopulmonary and Lung Cancer Mortality Risks Increase Monotonically with Exposure to Long-Term Fine PM

(Adapted from: Pope, Burnett, Thun, Calle, Krewski, Ito, and Thurston, 2002)

Long-term exposure to fine particles has also been estimated to take more than a year from the life expectancy of people living in the most polluted cities, relative to those living in cleaner cities. For example, Brunekreef (1997) reviewed the available evidence of the mortality effects of long-term exposure to PM air pollution and, using life table methods, derived an estimate of the reduction in life expectancy implied by those effect estimates. Based on the results of Pope et al. (1995) and Dockery et al. (1993), a relative risk of 1.1 per 10 $\mu\text{g}/\text{m}^3$ exposure over 15 years was assumed for the effect of fine PM air pollution on men 25-75 years of age. A 1992 life table for men in the Netherlands was developed for 10 successive five-year categories that make up the 25-75 year old age range. Life expectancy of a 25 year old was then calculated for this base case and compared with the calculated life expectancy for the PM exposed case where the death rates were increased in each age group by a factor of 1.1. A difference of 1.11 years was found between the “exposed” and “clean air” cohorts’ overall life expectancy at age 25. A similar calculation by the authors for the 1969-71 life table for U.S. white males yielded an even larger reduction of 1.31 years for the entire population’s life expectancy at age 25. Thus, these calculations indicate that

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differences in long-term exposure to ambient PM_{2.5} can have substantial effects on life expectancy.

The above discussed increases in mortality documented by these studies represents only the “tip of the iceberg” of effects that would result. As shown in Figure 3 below, for every death associated with air pollution, there is a pyramid of much greater numbers of morbidity effects, including hospital admissions, emergency department visits, doctor visits, missed work days, missed school days, asthma symptoms days, etc. Clearly, when the whole scope of other adverse health effects associated with these air pollution deaths are considered, there is no doubt as to the significance of these adverse effects.

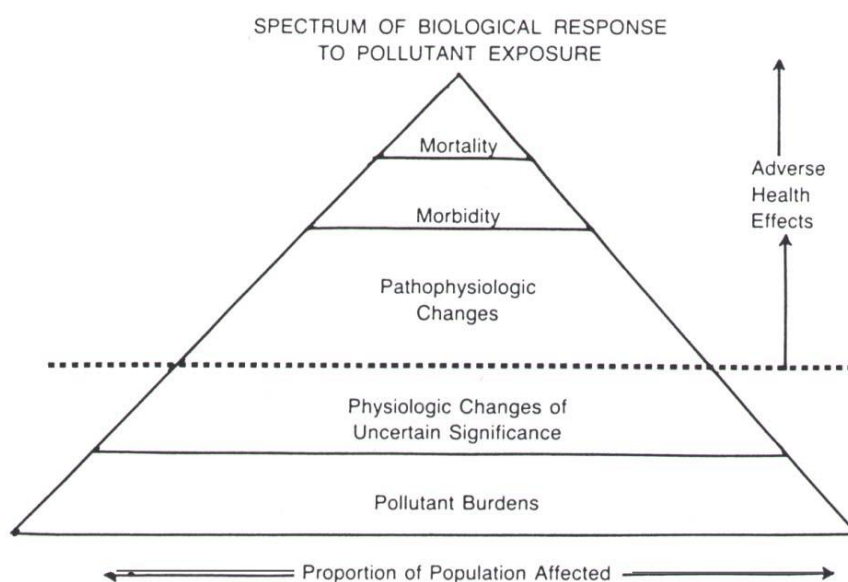


Figure 3. The Pyramid of Adverse Health Effects of Air Pollution on Health

(From: *Guidelines as to what constitutes an adverse respiratory health effect, with special reference to epidemiologic studies of air pollution.* Am Rev Respir Dis. 1985 Apr;131(4):666-8.)

My recent studies, and those by others, have also found that long-term exposure to combustion-related fine particulate air pollution is an important environmental risk factor for cardiopulmonary and lung cancer mortality. Air pollutants associated with fossil fuel combustion (e.g., from oil, coal and natural gas fired fossil fuel combustion sources) have well-documented adverse human health effects. The health impact is particularly high for particulate matter from fossil fuel-burning facilities, such as coal burning, which has been

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associated with an ischemic heart disease mortality risk that is roughly five times that of the average for PM_{2.5} particles in general (Thurston et al., 2016), and more damaging per $\mu\text{g}/\text{m}^3$ than PM_{2.5} from other common sources (Figure 4).

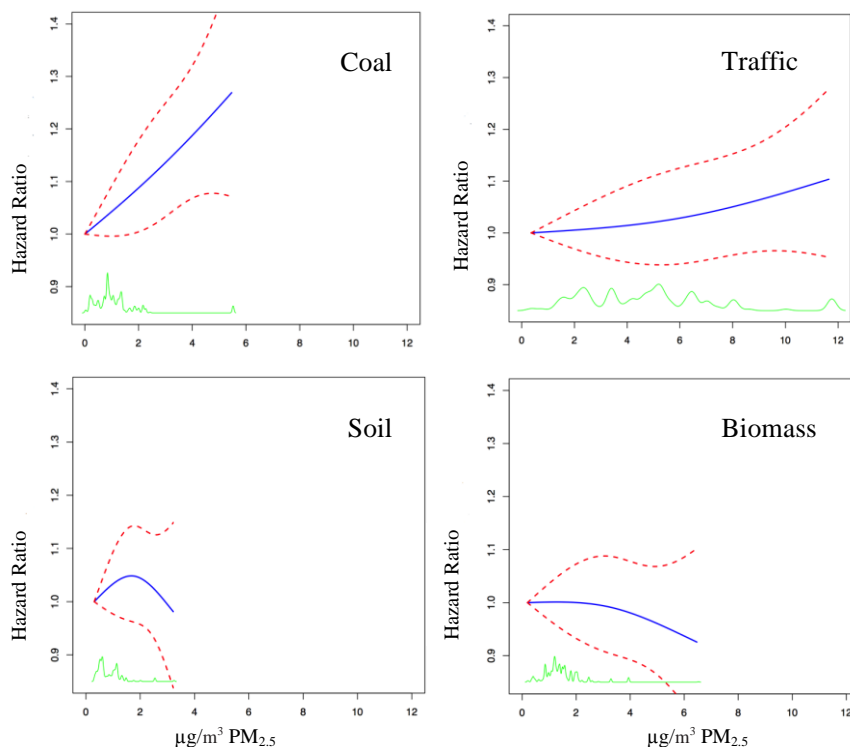


Figure 4. Concentration-response curve (solid lines) and 95% confidence intervals (dashed lines) for Source-Specific PM_{2.5} mass in the US ACS Cohort. (Thurston et al., 2016).

The United States Environmental Protection Agency (EPA) is required under Sections 108 and 109 of the Clean Air Act to periodically evaluate the air quality criteria that reflect the latest scientific information relevant to review each of the regulated air pollutant's National Ambient Air Quality Standard (NAAQS). The EPA recognized the adverse health effects of small particulate matter (PM) air pollution as early as 1987 when, pursuant to its authority under the Clean Air Act, it promulgated a NAAQS for particulate matter that is 10 micrometers in diameter or smaller (PM₁₀). The NAAQS promulgated by EPA are required for certain air pollutants "that may reasonably be anticipated to endanger public health and welfare." The NAAQS' air criteria must be "requisite to protect the public health" with an "adequate margin of safety." Under the particulate matter NAAQS, states must reduce PM₁₀ concentrations in their ambient atmosphere to no more than 50 micrograms per cubic meter on an annual average

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basis, and to no more than 150 micrograms per cubic meter on an average 24-hour period. Prior to 1987, EPA's particulate NAAQS had only regulated total suspended particulate matter. The focus in 1987 on smaller particles -- that is, 10 micrometers or less -- resulted from increasing scientific evidence that human inhalation of smaller particles had more serious respiratory effects than larger particles.

In 1994, EPA began the process of again reviewing its particulate matter standards. In 1996, EPA proposed a new NAAQS for even smaller particles -- those that are 2.5 micrometers in diameter or smaller ("PM2.5"). In July 1997, upon determining that the PM10 NAAQS is no longer protective of human health, 62 Fed. Reg. 38652, 38665 (July 18, 1997), EPA issued a final rule revising the NAAQS for PM to include two new NAAQS for PM2.5. These consisted of: 1) a long-term annual standard of 15 ug/m³, annual arithmetic mean, averaged over three years from single or multiple community-oriented monitors; and 2) a 24-hour standard that is met when the three-year average of the 98th percentile of 24-hour PM2.5 concentrations at each population-oriented monitor within an area does not exceed 65 ug/m³. 62 Fed. Reg. 38652, 38679 (July 18, 1997). These new PM2.5 standards were based on an increasing scientific consensus that the current NAAQS for PM10 was not sufficiently protective of human health. EPA's scientific review concluded that fine particles, in the 2.5 micrometer and smaller range, penetrate more deeply into the lungs, and may be more likely than coarse particles to contribute to the health effects (e.g., premature mortality and hospital admissions) found in a number of recently published community epidemiological studies at concentrations that extend well below those allowed by the current PM10 standards. As EPA stated in its rulemaking, a greatly expanded body of community epidemiological studies provide "evidence that serious health effects (mortality, exacerbation of chronic disease, increased hospital admissions, etc.) are associated with exposures to ambient levels of PM, even in concentrations below current U.S. PM standard." (*Federal Register*, 1997). Since that time, the U.S. EPA has lowered the allowable limits of ambient concentration of PM2.5 to 35 µg/m³ and 12 µg/m³ for the daily and annual standards, respectively, in recognition of its effects at lower levels of exposure.

The EPA PM Staff Paper at the time of the setting of the PM2.5 standards concluded that "fine and coarse particles can be differentiated by their sources and formation processes, chemical composition, solubility, acidity, atmospheric lifetime and behavior, and transport

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distances.” EPA also concludes that: “Primary fine particles are formed from condensation of high temperature vapors during combustion”; and that: “Fine mode PM is mainly composed of varying proportions of several major components: sulfates, nitrates, acids, ammonium, elemental carbon, organic carbon compounds, trace elements such as metals, and water.” (U.S. EPA, 1996b).

There is no evidence to date that there is any threshold below which the adverse effects of air pollution will not occur. For example, the incremental effects of sulfate containing fine particles, and the lack of a threshold of air pollution effects at ambient levels are indicated for sulfate and hospital admissions in Figure 5 below.

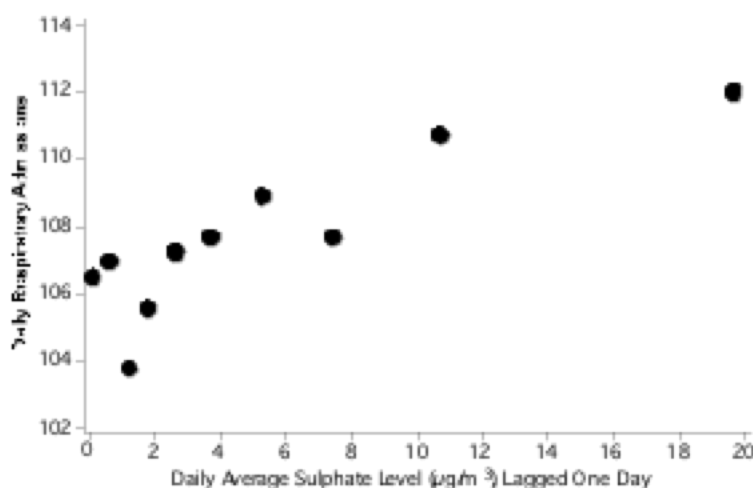


Figure 5. Average number of respiratory admissions among Ontario hospitals adjusted for other factors, by decile of the daily average sulfate fine particle concentration (ug/m3). (Burnett et al, 1994).

In addition, as displayed in the Figure 6 below, my research has shown that increases in long-term exposure to PM_{2.5} particulate matter air pollution are associated with increases in the risk of cardiovascular death among those exposed, even well below the present 12 µg/m³ annual PM_{2.5} air quality standard (Thurston et al., 2016). This lack of a threshold of effects indicates that any reduction in air pollution can be expected to result in commensurate health benefits to the public at ambient levels, even below the legal ambient pollution standards. I have served as a contributing author of the 1996 and the 2003 PM Criteria documents. In addition, my research was cited by the U.S. EPA as a “key study” in promulgating both the PM_{2.5} and

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ozone air quality standards in the past. I was also called upon by both the U.S. House and Senate to testify regarding the human health effects of air pollution when they were considering these new air quality standards.

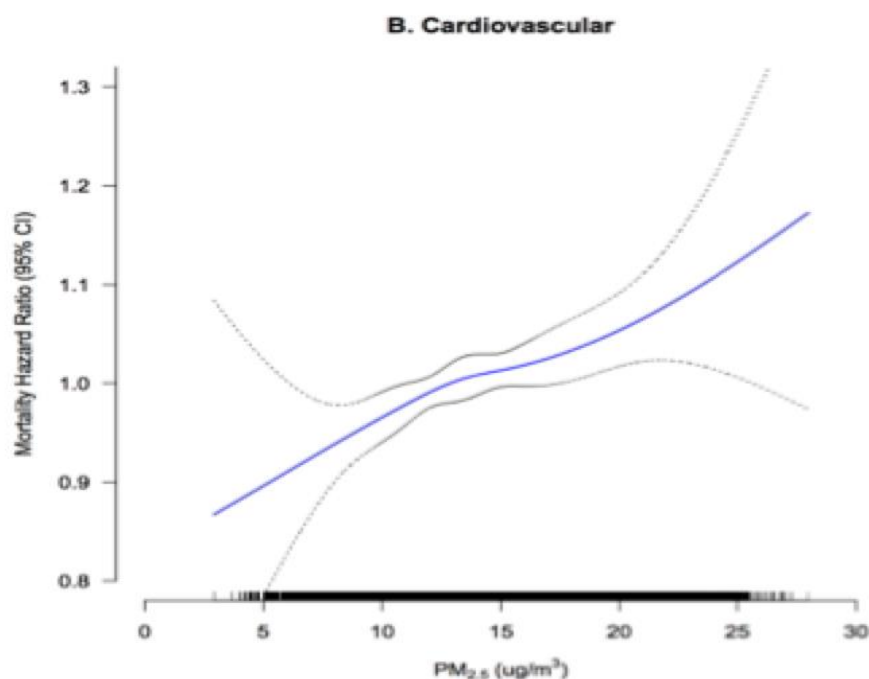


Figure 6. Mortality Risk from Cardiovascular Disease Increases with Rising PM_{2.5} Exposure, Even Well Below the Present US Ambient Air Quality Standard annual limit for PM_{2.5} (12 µg/m³). Thurston et al, 2016.

Furthermore, in its calculations of the benefits of potentially reducing the PM_{2.5} NAAQS, EPA has also implicitly acknowledged that there can be extant adverse health risks occurring below the NAAQS. For example, in a recent EPA Regulatory Impact Analysis for reducing the annual PM_{2.5} standard from 15 µg/m³ to 12 µg/m³ (U.S. EPA, 2012), EPA included a figure summarizing the best, most current science regarding PM_{2.5} health effects, which clearly illustrates that air pollution deaths occur below the existing PM_{2.5} NAAQS (35 µg/m³ for the daily standard, and 12 µg/m³ for the annual standard). Figure 7 provides EPA's best estimate of the deaths that would be avoided by implementing the proposed more stringent standard, with roughly half of the avoided deaths occurring in places where the air would be cleaned to levels below (i.e., with air quality better than) the proposed air quality standard. While this particular EPA analysis is for the annual average concentrations, the same principle of effects occurring below the standard applies to the short-term PM_{2.5}

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standard as well. Thus, just as cleaning the air below the standards would avoid more of those deaths, any increase in pollution will increase the risk of adverse effects at all levels of prevailing air pollution, even when the NAAQS standards are not violated.

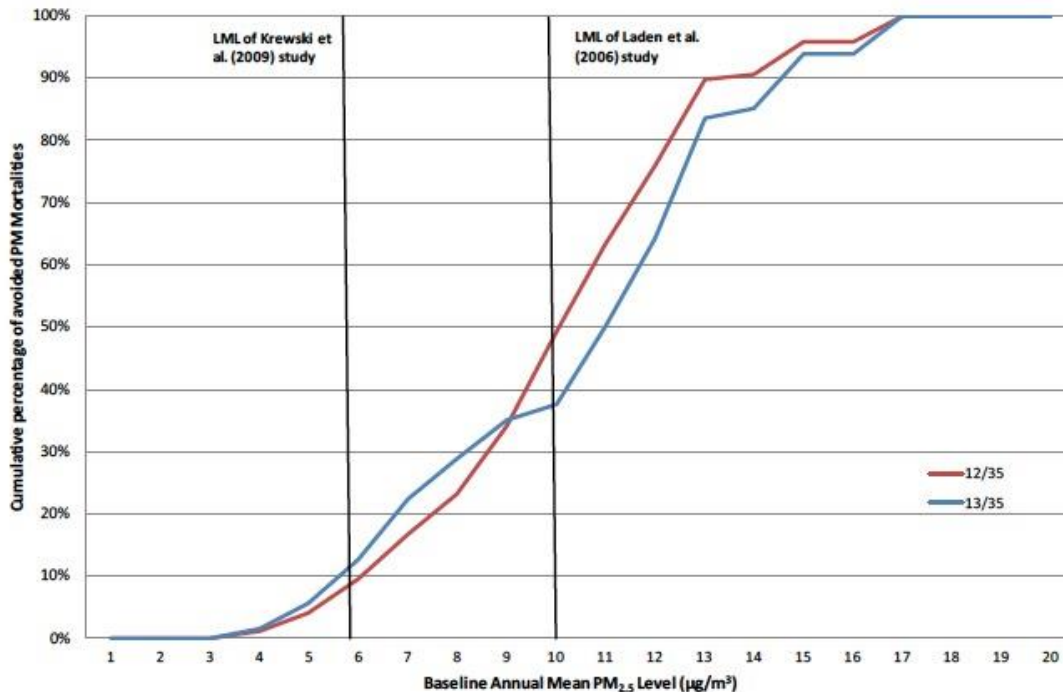


Figure 7. U.S. EPA Regulatory Impact Assessment of the Number of Premature PM_{2.5}-Related Deaths Avoided for 12/35 vs. 13/35 Ambient PM_{2.5} Air Quality Standards. (LML = Lowest Measured Level of PM_{2.5} in the study population) (U.S. EPA 2012, Fig. 5-7)

It should be noted that the U.S. EPA agrees with me that meeting an air quality standard does not prevent significant adverse health effects from occurring in the exposed population. Indeed, in its 2013 rulemaking, adopting the revised annual particulate matter NAAQS standard, EPA explained that “evidence- and risk-based approaches using information from epidemiological studies to inform decisions on PM_{2.5} standards are complicated by the recognition that *no population threshold, below which it can be concluded with confidence that PM_{2.5}-related effects do not occur, can be discerned from the available evidence.*” (emphasis added). (U.S. EPA, 2013).

PM_{2.5} is directly emitted by both stationary sources (e.g. fossil fuel combustion sources and other industrial sources) and mobile sources, such as diesel buses and trucks. PM_{2.5} is also

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formed in the atmosphere from gaseous emissions, such as sulfur oxides from fossil fuel combustion, resulting in “secondary” PM_{2.5}.

PM_{2.5} air pollution has been carefully studied in the past few decades. PM is composed of two major components: “primary” particles, or soot, emitted directly into the atmosphere by pollution sources, and; “secondary” particulate matter, formed in the atmosphere from gaseous pollutants, such as the sulfur oxides (SO_x) and nitrogen oxides (NO_x) also emitted by fossil fuel combustion sources. After formation in the atmosphere, this secondary PM largely condenses upon the smallest existing primary particles that, collectively, represent the greatest surface area for the secondary PM to condense upon. These particles are very small, commonly having an aerodynamic diameter of less than 1.0 micrometer (μm) – a fraction of the diameter of a human hair. For example, after it is released from a smokestack, gaseous SO_x is chemically converted in the atmosphere to become sulfate PM.

There is ever-growing scientific evidence indicating that particulate matter (PM) air pollution emitted by fossil fuel combustion is among the important contributors to the toxicity of PM_{2.5}. Evidence from historical pollution episodes, notably the London Fog episodes of the 1950's, indicate that extremely elevated daily particulate matter concentrations from fossil fuel combustion may be associated with excess acute human mortality (Ministry of Health of Great Britain, 1954).

Recent epidemiological and toxicological evidence also suggests that the particles resulting from fossil-fuel combustion air emissions are among the most toxic in our air. Indeed, my own published analysis of U.S. mortality and PM by source category found that combustion-related particles were more strongly associated with variations in annual mortality rates across U.S. cities than were other components of PM (Ozkaynak and Thurston, 1987). More recently, an analysis by Laden and co-authors (2000) at Harvard University of PM sources and daily pollution confirms that fossil fuel combustion particles were among the PM components that most affected daily variations in mortality. In addition, toxicological studies have indicated that particles resulting from fossil-fuel combustion that contain metals are very toxic to cells in

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the lung. Thus, both the toxicological and epidemiological evidence available indicate that pollution from fossil-fuel combustion are of great human health concern.

The conclusion that fossil fuel combustion particle pollution is one of the more toxic types of particles that we breathe is supported by the facts that combustion particles have different sizes, physio-chemical characteristics, and deposit in different parts of the lung than other more “natural” particles, such as wind-blown soil.

In the past, I have testified that this is especially true of coal-fired power plant emissions, but since all fossil-fuel emissions particles share certain key characteristics, such as containing transition metals, this is also true of oil-fired and natural gas-fired emissions. Although the mass of particles emitted per unit energy is less for oil- and gas-fired units, there is no reason to believe that they are less toxic on a pound for pound basis, and every reason to expect they would be more toxic, since there are so many more ultrafine particles emitted by natural gas burning facilities, per pound of emission, and ultrafine (e.g., nanoparticles) are thought to be far more toxic per unit mass than large particles, because they can reach deep into the lung, and even pass across the lung’s membranes into the bloodstream to travel systemically throughout the body of a person who breathes them.

Such fossil-fuel combustion particles are very small, and can defeat the body’s natural defenses, thereby having a far greater adverse effect on health. In particular, these fossil fuel combustion particles are enriched in toxic metals, such as arsenic and cadmium, as well as in transition metals, such as iron and vanadium, that can cause damaging oxidative stress in lung cells (see, e.g., Costa et al, 1997; Dreher et al, 1997, and Lay et al, 1999). This may also be especially true in the case of fossil fuel combustion particles because such PM is composed of very small particles that bypass the natural defenses of the lung, and therefore can penetrate deep into the lung where they are not easily cleared, and can therefore reside there for long times, potentially causing significant damage to the lung and to the human body. Thus, PM air pollution from the combustion of fossil fuels, including natural gas-fired units, is cause for special concern, and the health of persons in nearby populations can be adversely affected by this fossil fuel combustion related air pollution.

Epidemiological studies support the conclusion that sulfate containing particles (i.e., fossil fuel combustion products) are among the most toxic particles (e.g., Ozkaynak and

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Thurston, 1987; Dockery et al., 1993; and Pope et al., 1995, and 2002). In my own published research examining the associations of PM with human mortality, we have found that PM emitted from fossil-fuel combustion and from the metals industry are more strongly associated with mortality than particles from other sources, such as soil-derived and automobile emission-related particles (Ozkaynak, H. and Thurston, G.D., 1987, Associations between 1980 U.S. mortality rates and alternative measures of airborne particle concentration. *Risk Analysis* 7:449-460). An example of the relationship that has been found between sulfate fine particle pollution and mortality is shown in Figure 8.

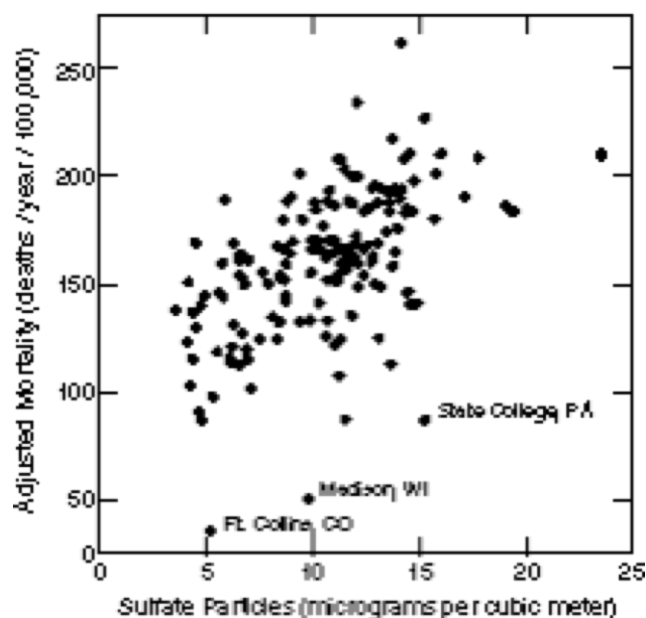


Figure 8. Age-, sex-, and race-adjusted population-based mortality rates for U.S. metropolitan areas in 1980 plotted versus mean sulfate fine particle air pollution levels. (Adapted from Pope, et al 1995).

Lab studies also suggest that the presence of acidity in particles, which is usually the case for fossil fuel combustion emissions, increases the toxicity of PM (e.g., Chen, et al, 1990). This conclusion is supported by studies of human respiratory cells (e.g., Veronesi et al., 1999). The presence of acidity increases the solubility of toxic metals, thereby making them more biologically-available to damage the body. This may be an important pathway by which acidic particles, such as those resulting from fossil fuel combustion, can have heightened toxicity versus other ambient particles, and provides a plausible physiological mechanism for the epidemiological associations found between acidic particle exposures and adverse human health effects.

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Particulate matter from the combustion of different fossil fuels generally have shared characteristics. Fossil fuels have all undergone a similar process — they have a similar derivation, they have been underground and compressed, and they are combusted in relatively similar ways. Also, fossil fuel emissions consist of very fine particles, tiny particles, that have large surface areas available to interact with the lung. And the particles have transition metals in them. For example, the percentages of transition metals are similar for natural gas and residual oil.

Second because fossil fuel particles, especially those near a fossil fuel burning facility, are freshly combusted, they have more active sites on them by which to damage health. The work by Oberdorster has shown PM concentrations at ambient levels, $60 \mu\text{g}/\text{m}^3$ and less, cause mortality in healthy rats. And then he found the aging of those fumes with aggregation of the ultrafine particles significantly decreased their toxicity. So “fresher” (more recently generated) particles are more toxic. Thus, living near a major fossil fuel combustion facility is more impactful because both the concentrations breathed are higher than downwind, but also because they are more recently emitted, and likely more reactive than more aged particles downwind.

Since fossil fuel particles are all fresh aerosols when they are coming out of the facility, and they are combustion aerosols, they share many characteristics. Hence, even though we haven't directly studied natural gas particles, since they share many of the same characteristics as particles from oil and coal combustion, it is very likely that they would share the toxicity of their “sister” fuels, and potentially at a higher effect per pound of pollution breathed.

Freshly combusted particles will have sharp edges, and will be composed, in part, of unoxidized compounds that haven't been neutralized. The sharp edges are the active sites at which these particles irritate and interact with the lining of the lung. Natural gas particles from combustion turbines that use ammonia as part of an SCR system, also include ammonium bisulfate, which is strongly acidic. Unoxidized and acidic compounds would be more reactive, and therefore, be more likely to irritate and interact with the lining of the lung, and, in combination with the metallic components of fine particles, cause more damage than aged and neutralized particles.

Although the quantities, in terms of mass per unit Btu are lower, there is no evidence that, on a pound for pound basis, the particles from gas-fired facility are any less toxic than

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PM2.5 from other fossil fuels. Indeed, because gas-fired sources can emit a much greater percentage of the particles as ultra-fine particles, which have a much higher surface area per mass than larger particles, it is likely that there is a much *greater* effect per pound of PM2.5 emitted by gas-fired sources than for PM2.5 emitted by sources burning other fossil fuels. For this reason, the impacts of the proposed facility in terms of PM2.5 mass concentration are an inadequate indication of the health risks associated with the proposed BCS.

In my own research, I have found that acute (short-term) increases in PM air pollution are associated with increases in the number of daily asthma attacks, hospital admissions, and mortality. In particular, I have found that both ozone and particulate matter air pollution is associated with increased numbers of respiratory hospital admissions in New York City, Buffalo, NY, and Toronto, Ontario, as well as with mortality in cities such as Chicago, IL, and Los Angeles, CA (see, e.g., Thurston et al. 1992). My results have been confirmed by other researchers considering locales elsewhere in the U.S. and throughout the world (see, e.g., Schwartz, J., 1997; and see: U.S. EPA, 2001). I was a Principal Investigator of a study published in the Journal of the American Medical Association (JAMA) in March of 2002, that shows that shows that long-term exposure to combustion-related fine particulate air pollution is an important environmental risk factor for cardiopulmonary and lung cancer mortality. In fact, it was found that the increase in risk of lung cancer from long-term exposure to PM2.5 in a polluted city was of roughly the same size as the increase in lung cancer risk of a non-smoker who breathes passive smoke while living with a smoker, or about a 20% increase in lung cancer risk. (Pope et al, 2002).

Among the groups of persons found in scientific research to be especially affected by environmental insults, including particulate matter air pollution, are: the very young, the poor, the very old, and persons with pre-existing health conditions, such as heart disease and asthma. (see, e.g., U.S. EPA, 1996). Ethnicity, age and pre-existing medical conditions play a role in determining whether adverse health impacts are the predictable result of exposure to increased PM2.5 emissions. Analyses by me and by others in the field of air pollution health effects indicate that the poor are especially at risk from air pollution (e.g., Gwynn and Thurston, 2001). Similarly, older adults are at greater risk of severe adverse outcomes from air pollution. Also, children, a population known to be especially susceptible to the effects of air pollution because their bodies are developing (and because they spend larger amounts of time exercising outside)

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are an especially affected sub-population that is well represented in the community surrounding the facility. This subpopulation of children can be expected to be among those most strongly affected by any increases in PM_{2.5} concentrations in the vicinity of the facility.

It is reasonable to assume that nearby residents will be exposed to these emissions even while inside their apartments? Outdoor air pollution, and especially fine particle pollution, is known to infiltrate into buildings with high efficiency as exchanges between outdoor and indoor air occur (via transfer through windows, doors, ventilation systems, etc.). As the levels of air pollution in the air outside a building increase, the exposures of residents inside the building to pm of outdoor origins will therefore also rise.

While other PM_{2.5} exposures, such as indoor air pollution, may have health effects, they are independent of the impacts of increases of exposures to PM_{2.5} of outdoor origins in general and of the proposed facility in particular. If the levels of outdoor PM_{2.5} impinging the living areas of residents increase, then it can be expected that their personal exposures to PM_{2.5} of outdoor origins, and their associated health risks,

There are two known characteristics of natural gas combustion particles that make them likely to have especially high health effects, on a per pound basis, than usual PM_{2.5}: 1) they have a higher percentage of ultrafine particles, as compared with other fossil-fuel options (see Figure 9). These ultrafine particles have very high surface areas, relative to other fossil-fuel emissions, which likely increase the health impacts of gas-fired PM considerably; and 2) there are acidic sulfates associated with these emissions, especially as strongly acidic ammonium bisulfate. Both of these factors would tend to increase the "bio-availability" of the toxins for gas-fired PM, which would therefore likely increase the toxicity of gas-fired combustion particles, relative to other ambient particles.

Cumulative Mass Distribution

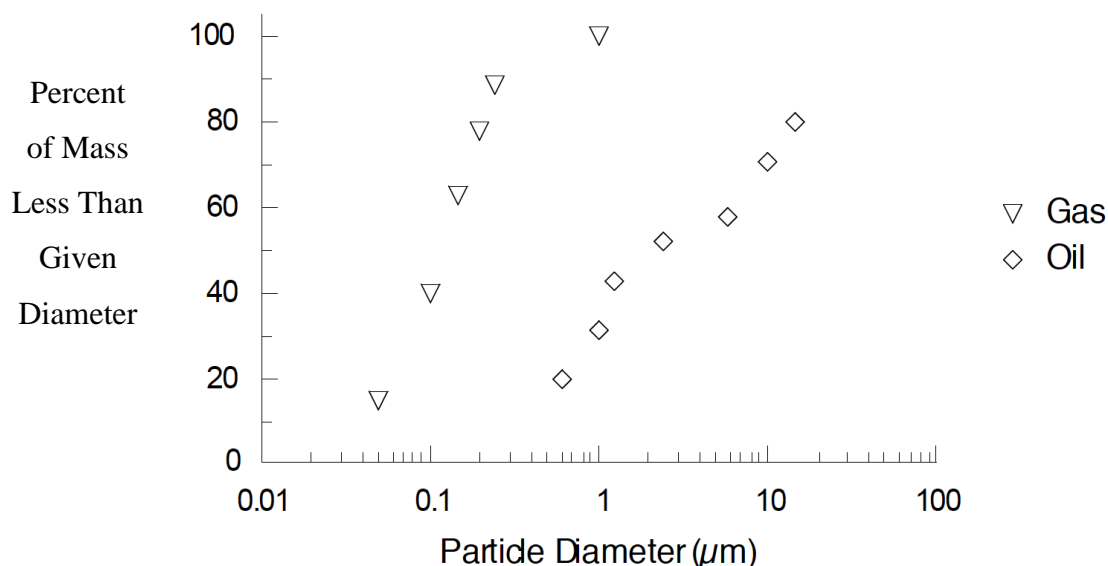


Figure 9. Comparison of Particle Mass Size Distribution for Natural Gas vs. Oil Combustion Emissions. Source: Environmental Protection Agency, "Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources. Fifth Edition," AP-42. Table 1.3-4 (9/98), Table 3.1-1 (10/96)

The composition of gas combustion particles also makes them to likely be more toxic than usual PM_{2.5}. As summarized in Table 1, a comparison of the metal content of gas-and oil-fired particles shows that gas-fired particles have just as high or higher a percentage of a number of metals as oil-fired particles, including barium, cadmium, chromium, molybdenum and zinc. Moreover, even if one assumes that total metals content is generally lower in gas-fired particles, a higher percentage of gas-fired particles are ultrafine particles, compared to particles from other combustion sources (e.g. residual oil combustion particles). This can be expected to increase the toxicity of these metals, relative to other combustion sources with a smaller percentage of ultrafines (e.g., residual oil combustion particles). Thus, there is a high presence of ultrafine particles that are high in transition metal content, making them of especially high toxicity.

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Table 1. Metal Content of Natural Gas vs. Residual Oil PM Emissions

Pollutant	PM Emissions (lb./MMBtu)		PM Emissions as % of PM Mass	
	Natural Gas	Residual Oil	Natural Gas	Residual Oil
Antimony		3.5E-05		0.070%
Arsenic	2.0E-07	<8.8E-06	0.003%	0.018%
Barium	4.3E-06	1.7E-05	0.058%	0.034%
Beryllium	<1.2E-08	<1.9E-07	0.000%	0.000%
Cadmium	1.1E-06	2.7E-06	0.014%	0.005%
Chloride		2.3E-03		4.641%
Chromium	1.4E-06	5.6E-06	0.018%	0.011%
Cobalt	8.2E-08	4.0E-05	0.001%	0.081%
Copper	8.3E-07	1.2E-05	0.011%	0.024%
Fluoride		2.5E-04		0.499%
Lead	4.9E-07	1.0E-05	0.007%	0.020%
Manganese	3.7E-07	2.0E-05	0.005%	0.040%
Mercury	2.5E-07	7.5E-07	0.003%	0.002%
Molybdenum	1.1E-06	5.2E-06	0.014%	0.011%
Nickel	2.1E-06	<5.6E-04	0.028%	1.130%
Phosphorus		6.3E-05		0.127%
Selenium	<2.4E-08	<4.6E-06	0.000%	0.009%
Vanadium	2.3E-06	2.1E-04	0.030%	0.425%
Zinc	2.8E-05	1.9E-04	0.382%	0.389%
Total PM	7.5E-03	5.0E-02		

Source: EPA, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources. AP-42, Tables 1.3-1 (with S = 0.3), 1.3-2, 1.3-11, 1.4-2, 1.4-4.

<https://www.epa.gov/air-emissions-factors-and-quantification>

Furthermore, the likely co-presence of strongly acidic vapor in the BCS emissions will tend to further enhance the bio-availability, and hence the toxicity, of the metals that are present. Sulfuric acid is the most strongly acidic form, with a pH of less than 1 at 50% RH, and ammonium bisulfate is also very strongly acidic, with a pH of 1-2 at 50% RH, while ammonium sulfate is only weakly acidic, with a pH of 5-6 (vs. a pH of 7.0 for completely neutral conditions) (NRC, 1978). Although the applicant has provided no data indicating the breakdown of ammonia sulfates in its proposed facility's emissions, the facility emissions can be expected to be in a strongly acidic, and therefore more toxic, form. The potential toxicity of exposure to these natural gas combustion metals cannot be dismissed, even at very low PM_{2.5} mass levels.

For all these reasons, the PM_{2.5} emissions from the new facility cannot be dismissed because of their high ultrafine fraction, their composition, and the likely co-presence of acidic vapors, they potentially could be more toxic than other forms of particulate matter. Thus, I

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disagree with the Supplemental Report's conclusion that "The emissions from the proposed BCS will result from combustion of clean burning natural gas; in no case, will the emissions cause air quality to exceed regulatory standards, which are protective of human health and the environment."

Studies using laboratory animals and humans support the notion that ambient or moderately elevated concentrations of relatively non-acidic, soluble sulfates or nitrates in particular harm health. Some controlled animal exposures of air pollution have shown adverse effects at PM_{2.5} at levels close to ambient levels. Recent animal experiments by Godleski and coworkers at Harvard indicate that exposures to elevated concentrations of ambient particulate matter (PM) can result in cardiac related problems in animals (Godleski et al., 1996, Godleski, 2000). The most biologically and clinically significant finding was that in dogs with induced coronary occlusion, particles affected one of the major ECG signs of myocardial ischemia in humans, known as elevation of the ST segment. Consistent cardiac effects at the biological level have also been found in human epidemiological studies, as well. For example, Pope et al (1999) and Gold et al (2000) report that PM exposure is associated with changes in human heart rate variability, confirming that biological changes do occur in heart function as a result of PM exposure.

C. The Human Health Effects of Ozone (O₃) and Nitrogen Oxides (NO_x) Air Pollution

Ozone (O₃) is an air pollutant, resulting from nitrogen oxide and hydrocarbon emissions from fossil fuel combustion, that adversely affects human health. Ozone is a highly irritating gas that is formed in the atmosphere in the presence of sunlight from other "precursor" air pollutants, including NO_x and hydrocarbons that are emitted by combustion sources such as fossil fuel burning facilities. The adverse health consequences of breathing ozone are serious and well documented. This documentation includes impacts demonstrated in controlled chamber exposures of humans and animals, and observational epidemiology showing consistent associations between ozone and adverse impacts across a wide range of human health outcomes.

The noxious nature of ozone is also evidenced by the way it visibly "eats away" at materials such as rubber, an elastic substance, sharing characteristics with human lungs. Indeed, in the early years of air pollution monitoring, the number of cracks in a stretched rubber band left outdoors for weeks was used as an index of the ozone concentration in the

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air. Similarly, ozone has been known to cause fading of certain colors in fabrics because they oxidize the dye, causing “O-fading.” As a result, automobile manufacturers today utilize ozone-resistant rubbers, while carpet and drape manufacturers use ozone-resistant dyes (NRC, 1976). In addition, Cass *et al.* (1991) have discussed the importance of protecting works of art from damage due to O₃. Given this evidence of ozone’s devastating effects on solid materials, it comes as no surprise that ozone can also have serious adverse health effects on the more vulnerable human lung.

Ozone can irritate the human respiratory system, causing exposed people to cough, feel an irritation in the throat, and/or experience an uncomfortable sensation in the chest area. Ozone has also been shown to reduce the lung’s ability to inhale and exhale, thereby making it more difficult for people to breathe as deeply and vigorously as they normally would (*e.g.*, see Bates, 1995). Research shows that ozone can also acutely aggravate asthma, and new evidence suggests that it may cause more children to get asthma. When ozone levels are high, people with asthma have more attacks that require a doctor’s attention or the use of additional medication. One reason this happens is that ozone makes people more sensitive to allergens, which are the most common triggers for asthma attacks. Ozone can inflame and damage cells that line the human lung, and O₃ has been compared by some to “getting a sunburn on your lungs.” Ozone may also aggravate chronic lung diseases, such as emphysema and bronchitis, and can reduce the immune system’s ability to fight off bacterial infections in the respiratory system.

Among the important adverse effects associated with ozone exposure to asthmatics is the triggering of asthma attacks. The effects of ozone air pollution on children with asthma have been demonstrated in my own research following a group of children at an asthma summer camp located in Connecticut. This study of a group of about 55 moderate to severely asthmatic children showed that these children experienced statistically significant reductions in lung function, increases in asthma symptoms, and increases in the use of unscheduled asthma medications as ozone pollution levels rose. As shown in Figure 10, the risk of a child having an asthma attack was found to be approximately 40 percent higher on the highest ozone days than on an average study day (Thurston *et al.*, 1997). Consistent with other research in this area, there is no indication in this plot of a threshold concentration below which children with asthma are safe from the effects of ozone increases.

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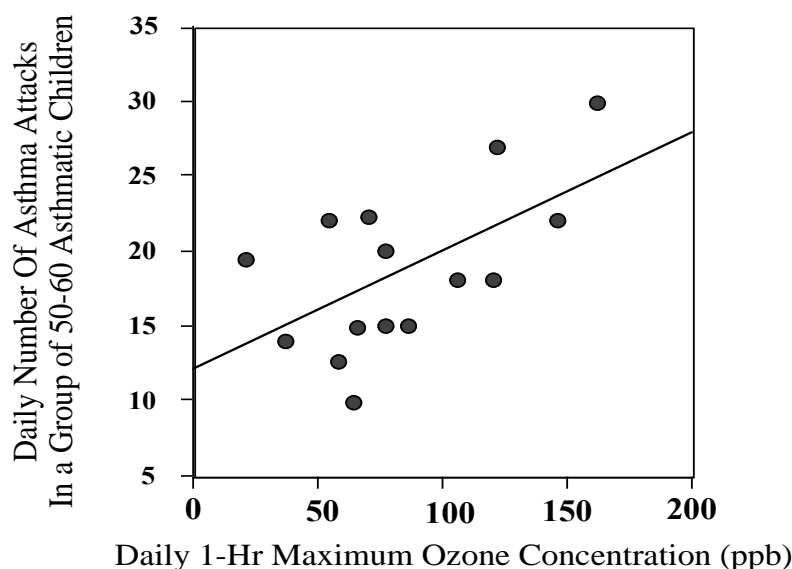


Figure 10. The number of asthma attacks among children at an “Asthma Camp” in Connecticut increase as the ozone levels rise (Source: Thurston *et al.*, 1997)

These asthma camp results have been confirmed by a larger study published in the Journal of the American Medical Association (JAMA). Gent *et al.* (2003) presented a cohort study of asthmatic children from the New Haven, CT area, including 130 children who used maintenance medications for asthma and 141 children who did not. The more severe asthmatics were identified as those using maintenance medication. For these severe asthmatics, the study found that the level of O₃ exposure was significantly associated with worsening of symptoms and an increase in the use of rescue medication. Each 50 parts per billion (ppb) increase in 1-hour average O₃ was associated with an increased likelihood of wheezing (by 35%) and chest tightness (by 47%). The findings indicate that asthmatic children are particularly vulnerable to ozone, even at pollution levels below the U.S. EPA air quality standards.

My own research has also shown ozone air pollution to be associated with diminished lung function in non-asthmatic healthy children at a YMCA summer camp in a pristine area in the Kittatinny Ridge, in the northwestern part of the state (Spektor *et al.*, 1988a). Similarly, in the summer of 1988, Berry *et al.* (1991) conducted a field health study at two summer day camps in suburban-central New Jersey. Thirty-four campers and counselors had daily lung function tests, and it was found that the campers had a statistically significant decrease in peak expiratory flow rate associated with increasing ozone concentrations, indicating an acute loss in the children’s ability to inhale and exhale after ozone exposure.

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The adverse effects of exposure to ozone in ambient air on the lungs of individuals has been demonstrated in studies that I have conducted in the State of New York, as well. For example, respiratory function damage was demonstrated in a study I co-authored of 30 healthy adult non-smokers engaged in a regular daily program of outdoor exercise in Tuxedo, NY during the summer of 1985 (Spektor *et al.*, 1988b). All measured health indices showed statistically significant O₃-associated decreases in the lung function of the runners as ozone levels increased. More recently, using lung bronchoscopy (which allows a visualization of the main tubes of the lungs, by means of a flexible lighted instrument introduced through the vocal cords and windpipe) and broncho-alveolar lavage (BAL, or a washing of the lining of the lung), Kinney *et al.* (1996) examined some 19 normal volunteer joggers from Governors Island, NY. The joggers exercised in the afternoon during the 1992 summer season. These results indicate a significant inflammatory response in the lungs of recreational joggers in New York City exposed to regional ozone and associated co-pollutants during the summer months.

Airway inflammation in the lung is among the serious effects that have also been demonstrated by controlled human studies of ozone at levels typically experienced by most Americans. Airway inflammation is especially problematic for children and adults with asthma, as it makes them more susceptible to having asthma attacks, consistent with the asthma camp results discussed above. For example, controlled human studies have shown that prior exposure to ozone enhances the reactivity of asthmatics to aeroallergens, such as pollens, which can trigger asthma attacks (*e.g.*, see Molfino *et al.*, 1991).

The increased inflammation of the lung, and diminished immune system effects associated with ozone air pollution can also make the elderly more susceptible to pneumonia, a major cause of illness and death in this age group. Both *in vivo* and *in vitro* experimental studies have demonstrated that O₃ can affect the ability of the immune system to defend against infection. Increased susceptibility to bacterial infection has been reported in mice at below 80ppb ozone for a single 3-hr exposure (Ehrlich *et al.* 1977). Related alterations of the pulmonary defenses caused by short-term exposures to O₃ include impaired ability to inactivate bacteria in rabbits and mice (Coffin and Gardner 1972; Ehrlich *et al.* 1979) and impaired macrophage defense mechanisms in the lung (Dowell *et al.* 1970; Goldstein *et al.* 1971; McAllen *et al.* 1981; Amoruso *et al.* 1981). Thus, the biological plausibility of the

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adverse air pollution health effects associations found by epidemiological studies is supported by a body of controlled exposure animal studies.

The O₃ - morbidity associations indicated by the above-presented epidemiological studies are also supported by a large body of data from controlled human exposure studies that give consistent and/or supportive results, and that have demonstrated pathways by which ozone can damage the human body when breathed. Clinical studies have demonstrated decreases in lung function, increased frequencies of respiratory symptoms, heightened airway hyper-responsiveness, and cellular and biochemical evidence of lung inflammation in healthy exercising adults. For example, in controlled exposure studies, McDonnell *et al.* (1991) and Devlin *et al.* (1991) found that prolonged controlled exposures of exercising men to levels of ozone common in present-day U.S. (only 80 ppb) resulted in significant decrements in lung function, induction of respiratory symptoms, increases in nonspecific airway reactivity, and cellular and biochemical changes in the lung.

Ozone exposure has also been shown to have adverse effects on athletic performance. Epidemiological evidence compiled more than three decades ago suggested that the percentage of high school track team members failing to improve performance increased with increasing oxidant concentrations the hour before a race (Wayne *et al.* 1967). Controlled exposure studies of heavily exercising competitive runners have demonstrated decreased function at 200 to 300 ppb (Savin and Adams 1979; Adams and Schelegle 1983). More recent studies have shown reduced athletic performance at even lower O₃ concentrations. Schlegle and Adams (1986) exposed 10 young male adult endurance athletes to 120, 180, and 240 ppb O₃ while they exercised for 60 minutes. Although all 10 completed the protocol for filtered (clean) air exposure, 1, 5, and 7 of them could not complete it for the 120, 180 and 240 ppb O₃ exposures, respectively, indicating that higher O₃ concentrations made exercising more difficult.

Another study considers a broadly relevant case showing the benefits of cleaner air. During the Atlanta Summer Olympics of 1996, traffic-related ozone and PM declined significantly as a result of the alternative mass transportation strategy implemented to reduce road traffic during the Games (Friedman *et al.*, 2001). These improvements were correlated with changes in the rate of children's hospital admissions. Compared to a baseline period, traffic related ozone and PM₁₀ levels declined by 28% and 16%, respectively.

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Concentrations of both PM and ozone also rose noticeably after the end of the Olympics. The study showed a significant reduction in asthma events associated with these pollution improvements. This study supports the hypothesis that improvements in acute air pollution can provide immediate health benefits.

Ozone may also cause permanent lung damage. For example, repeated short-term ozone damage to children's developing lungs may lead to reduced lung function in adulthood (*e.g., see* Kunzli et al, 1997). In adults, ozone exposure may accelerate the natural decline in lung function that occurs as part of the normal aging process (*e.g., see* Detels, *et al.*, 1987). One important study suggests that long-term ozone exposure can increase the chances that children will develop asthma disease (McConnell *et al.*, 2002).

Ozone has also been shown to have long-term cumulative health effects in the State of New Jersey in a study that included cadets from the U.S. Military Academy at West Point who attended special summer training in Fort Dix, New Jersey. There was a statistically significant drop in forced expiratory volume in 1 sec of 44 ml ($p = .035$), and there were also significant increases in reports of cough, chest tightness, and sore throat at the follow-up clinic visit: a larger decline in long-term mean Forced Expiratory Volume lung function was observed in cadets at Fort Dix, where ozone exposures were the highest (Kinney and Lippmann, 2000).

Emergency Room Visits and Hospital Admissions are also increased by O₃ air pollution. Cody *et al.* (1992) analyzed data on New Jersey hospital emergency department (ED) visits for asthma, bronchitis, and finger wounds (a non-respiratory control) for the period May through August for 1988 and 1989, finding that, when temperature was controlled for in a multiple regression analysis, a highly significant relationship between asthma visits and ozone concentration was identified. In addition, a 5-year retrospective study by Weisel *et al.* (1995) of the association between ED visits for asthma with mean ambient ozone levels was conducted for hospitals located in central New Jersey. An association was identified in each of the years (1986-1990), and ED visits occurred 28% more frequently when the mean ozone levels were greater than 60 ppb O₃, as compared to when they were less than 60 ppb O₃.

Epidemiological evidence has accumulated over recent years indicating a role of O₃

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in daily hospital admissions. As displayed in Figure 11, time-series studies conducted in the U.S. have shown increased risk of hospital admissions (Relative Risk > 1.0) at higher O₃ levels, even after accounting for the effects of PM (Schwartz, J. in Health at the Crossroads, 1997). This work has now been expanded to consider 36 cities across the U.S., finding that, during the warm season of the year, the 2-day cumulative effect of a 5-ppb increase in O₃ was an estimated 0.3% increase in the risk of chronic obstructive pulmonary disease admissions, and a 0.4% increase in the risk of pneumonia admissions (Medina-Ramon *et al.*, 2006).

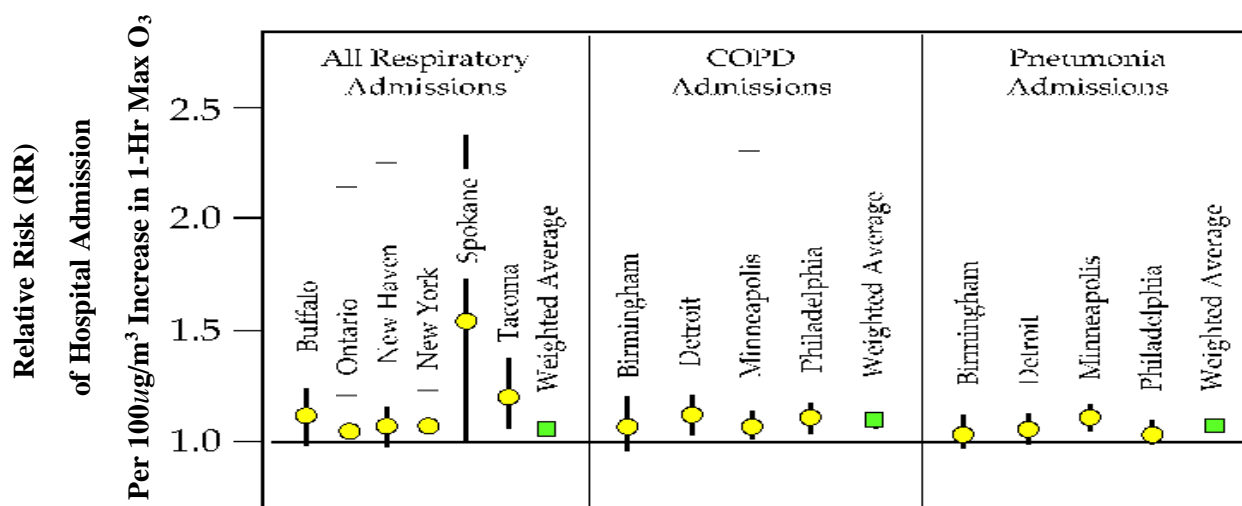


Figure 11. Studies of air pollution in many cities have shown increased risk of respiratory hospital admission (RR > 1.0) on days of high ozone air pollution (Source: Schwartz, J. in Health at the Crossroads, 1997).

Epidemiological evidence has also accumulated over recent years indicating a role by ozone in daily human mortality. As shown in Figure 12, time-series studies conducted in cities around the world have shown increased mortality (Relative Risk > 1.0) at higher ozone concentrations, even after accounting for the mortality effects of PM (Thurston and Ito, 2001).

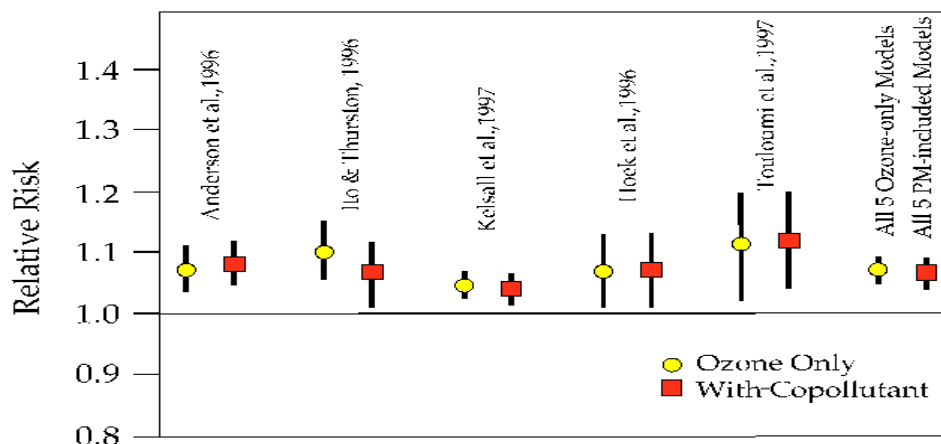


Figure 12. Studies indicate an increased risk of mortality (RR >1.0) at higher ozone concentrations, even after considering the effects of PM. (Source: Thurston and Ito, 2001)

Multi-city analyses have confirmed the ozone-mortality relationship. These include meta-analyses of multiple past ozone studies that show consistent associations between ozone and increases in mortality (Levy et al, 2005; Ito *et al.*, 2005; Bell *et al.*, 2005). In one analysis of some 95 U.S. cities over two decades published in *JAMA*, Bell et al (2004) showed that, even after controlling for PM and weather, an increase of 10 parts-per-billion in daily ozone pollution was associated with approximately a 0.5% increase in daily risk of death. As discussed earlier, this size percent increase in daily admissions, though small, affects a huge portion of the population and accumulates day after day, week after week, and month after month, so that it accumulates to account for thousands of deaths each year in the U.S.

More recently, mortality effects from long-term exposure to ozone air pollution has now been confirmed in a major cohort study (Jerrett et al, 2009; Turner et al, 2016). In Jerrett et al, data from the study cohort of the American Cancer Society Cancer Prevention Study II were correlated with air-pollution data from 96 metropolitan statistical areas in the United States. 448,850 subjects, with 118,777 deaths in an 18-year follow-up period were considered. Data on daily maximum ozone concentrations were obtained from April 1 to September 30 for the years 1977 through 2000. Data on concentrations of fine particulate matter (PM_{2.5}) were obtained for the years 1999 and 2000. Associations between ozone concentrations and the risk of death were evaluated with the use of standard and multilevel Cox regression models. In single-pollutant models, ozone was associated with the risk of death from respiratory causes. The estimated relative risk of death from respiratory causes

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that was associated with an increment in ozone concentration of 10 ppb was 1.040 (95% confidence interval, 1.010 to 1.067). The association of ozone with the risk of death from respiratory causes was insensitive to adjustment for confounders and to the type of statistical model used. In a follow-up analysis of this same database, Turner et al (2016) improved ozone exposure estimates by employing estimates of O₃ concentrations at the participant's residence, as derived from a hierarchical Bayesian space–time model. In two-pollutant models, adjusted for PM_{2.5}, significant positive associations remained between O₃ and all-cause (hazard ratio [HR] per 10 ppb, 1.02; 95% confidence interval [CI], 1.01–1.04), circulatory (HR, 1.03; 95% CI, 1.01–1.05), and respiratory mortality (HR, 1.12; 95% CI, 1.08–1.16) that were unchanged with further adjustment for NO₂.

Exposures to nitrogen oxides themselves have also been associated with adverse human health effects, in addition to leading to the formation of PM_{2.5} and ozone. As concluded in a U.S. EPA Risk and Exposure Assessment Report for NO_x (EPA-452/R-08-008a), research studies have provided scientific evidence that is sufficient to infer a similar relationship to also exist between short-term (e.g., daily) NO₂ exposure and adverse effects on the respiratory system. This finding is supported by the large body of recent epidemiologic evidence as well as findings from human and animal experimental studies. These epidemiologic and experimental studies encompass a number of endpoints including ED visits and hospitalizations, respiratory symptoms, airway hyperresponsiveness, airway inflammation, and lung function (U.S. EPA, 2008).

D. CONCLUSIONS

It is my conclusion that additional emissions from the proposed facility will add to the existing levels of PM_{2.5} and nitrogen oxides in the vicinity of the facility, and, because no threshold of air pollution effects has yet been found, any incremental air pollution exposures add an incremental adverse health risk to residents near a source of fossil fuel combustion air pollution. Also, such an increased population risk of health effects constitutes an individual adverse health effect has been confirmed by the American Thoracic Society (American Thoracic Society. “What constitutes an adverse health effect of air pollution?” Official statement of the American Thoracic Society. *Am J Respir Crit Care Med*. 2000 Feb;161(2 Pt 1):665-73.). Therefore, any action that increases ambient concentration of PM_{2.5} and other air pollutants in this area will have an adverse impact on human health in the exposed

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population. These incremental health effects risks would in no way be mitigated or negated by other respiratory health effects risks, such as indoor air pollution exposures, which would represent independent health risks of their own. I therefore conclude that, to the extent that the proposed facility will emit additional levels of PM_{2.5}, it will cause an increase in the risk of adverse health effects among those who breathe that pollution, and especially for the socio-economically disadvantaged populations living within the most affected areas immediately surrounding the facility. Furthermore, in addition to the effects of PM_{2.5}, the proposed facility's emissions of nitrogen oxides will also contribute to the increases in health risks from added local air pollution, as well as to the downwind formation of, and exposures to, ozone air pollution, and to associated downwind increases in adverse human health effects caused by those incremental O₃ exposures. This, this proposed facility will have both local and downwind adverse human health consequences.

Although the state's air quality modeling report concludes that “ the results of the air quality modeling analysis demonstrate that the proposed Buckingham Compressor Station Project does not cause or contribute to any exceedance of the NAAQS for NO₂, PM_{2.5}, PM₁₀ and CO”, this does not mean there are no health impacts, as there are no known thresholds of effects, as documented in this report. Quite the opposite, the report results indicate to me that the adverse human health effects of long-term (annual) exposures to PM_{2.5} at these locations will rise by at least 21%, while the adverse human health effects of short-term (24-hr) exposures to PM_{2.5} will rise by at least 44%. The reason the rise in risk will likely be higher than these percentages indicate is that, as discussed in this report, the PM_{2.5} from fossil fuel combustion has much greater health impacts (up to 5 times higher) than most other types of PM_{2.5} mass.

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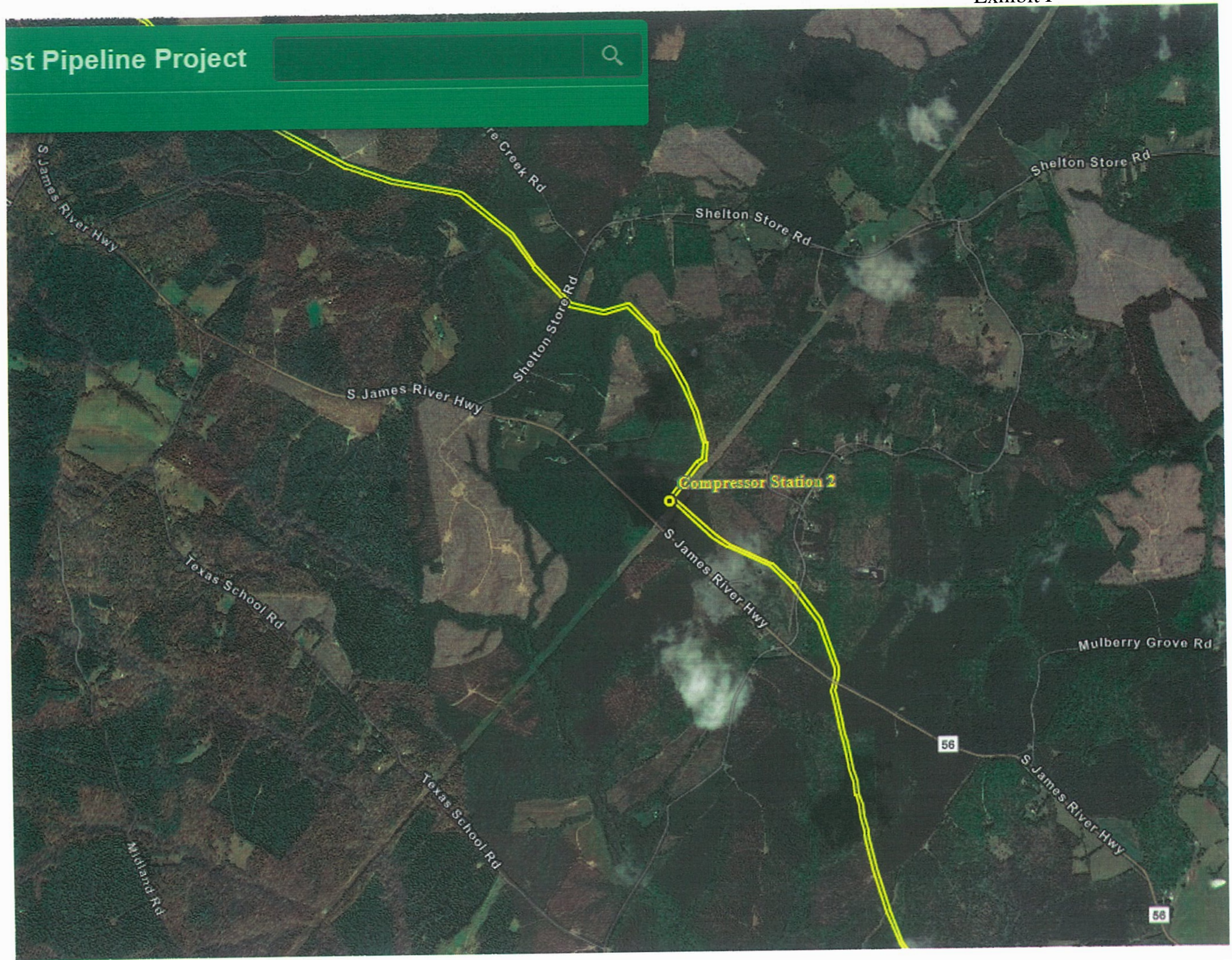
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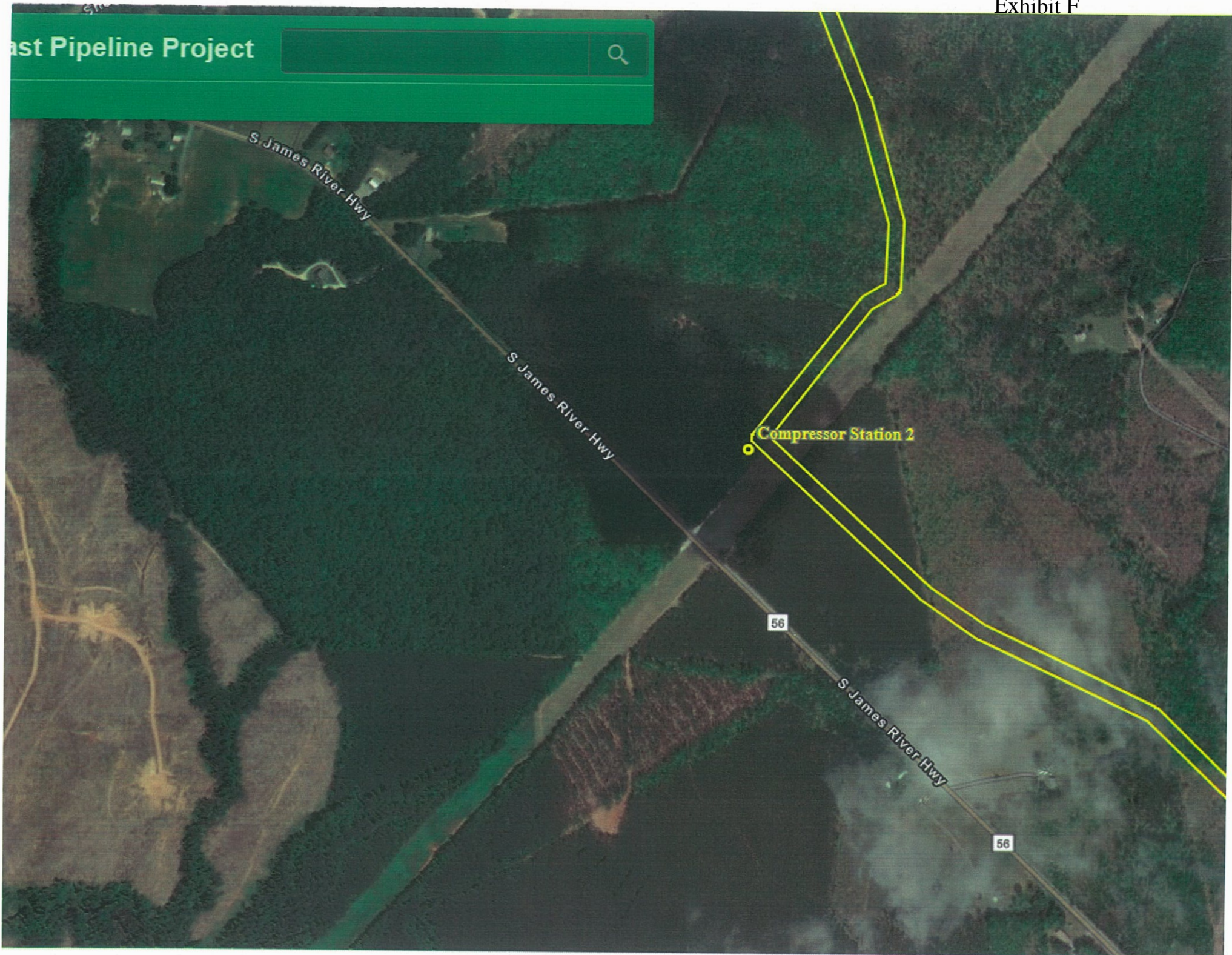
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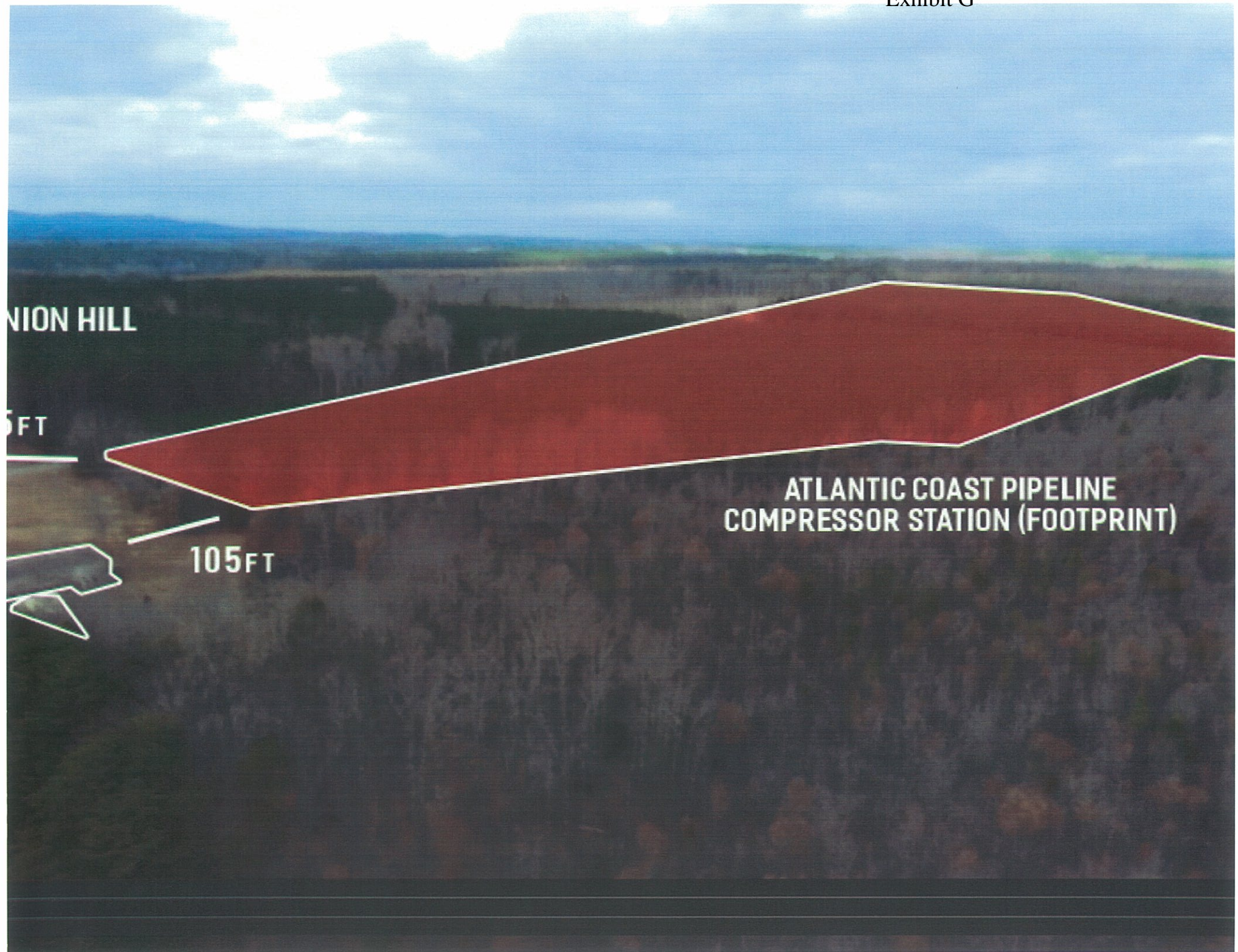


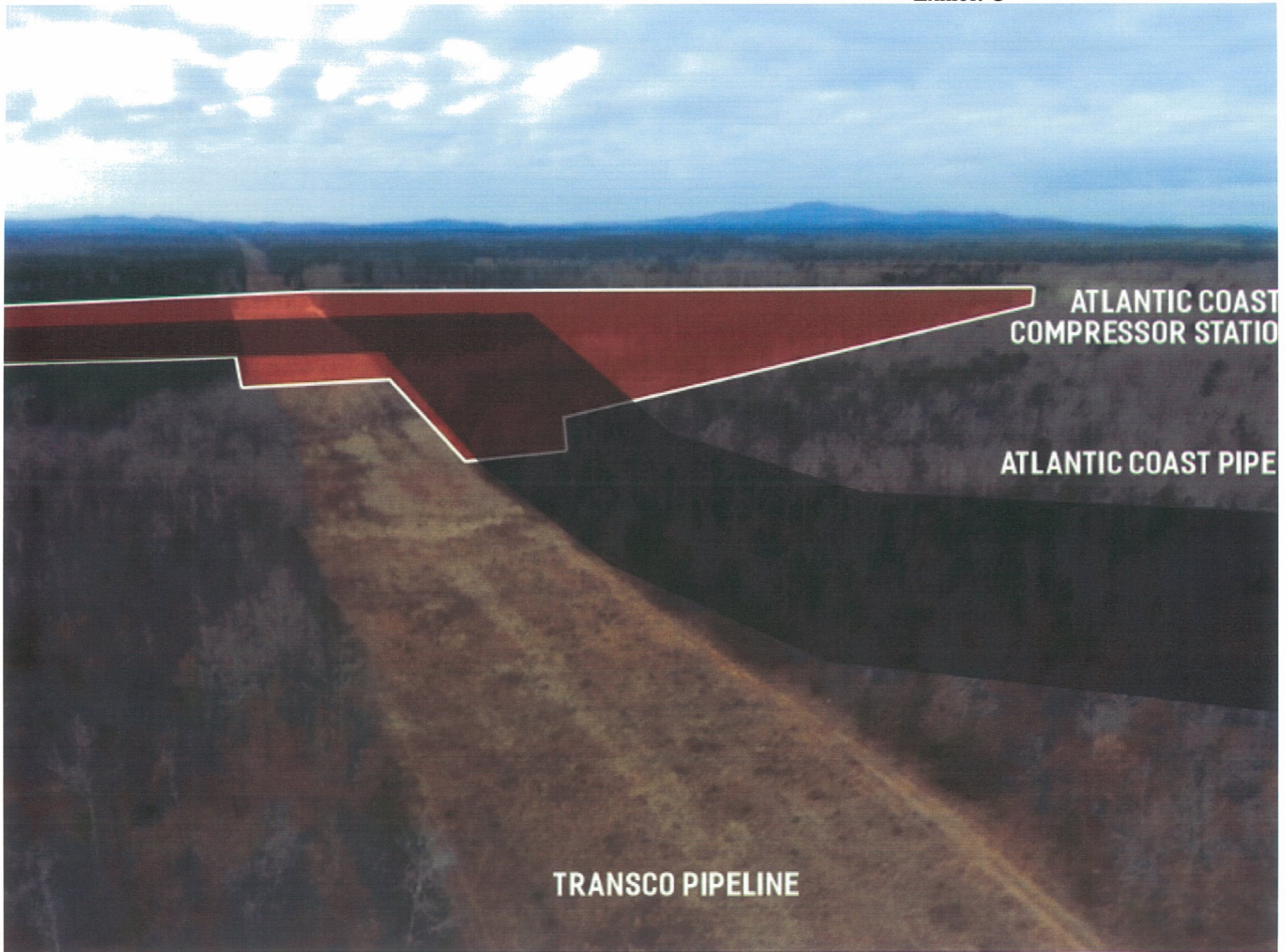


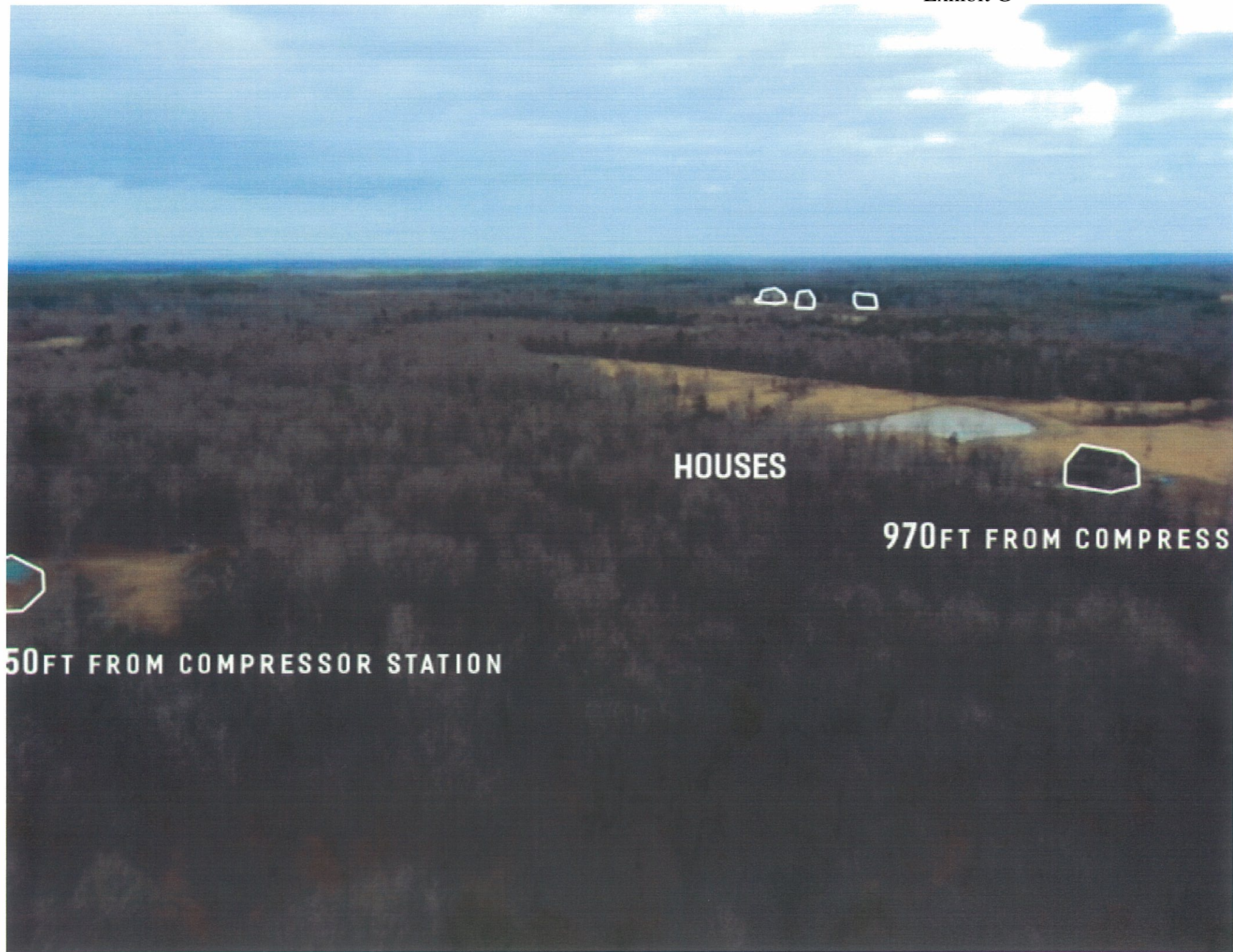
Google

Exhibit G









HOUSES

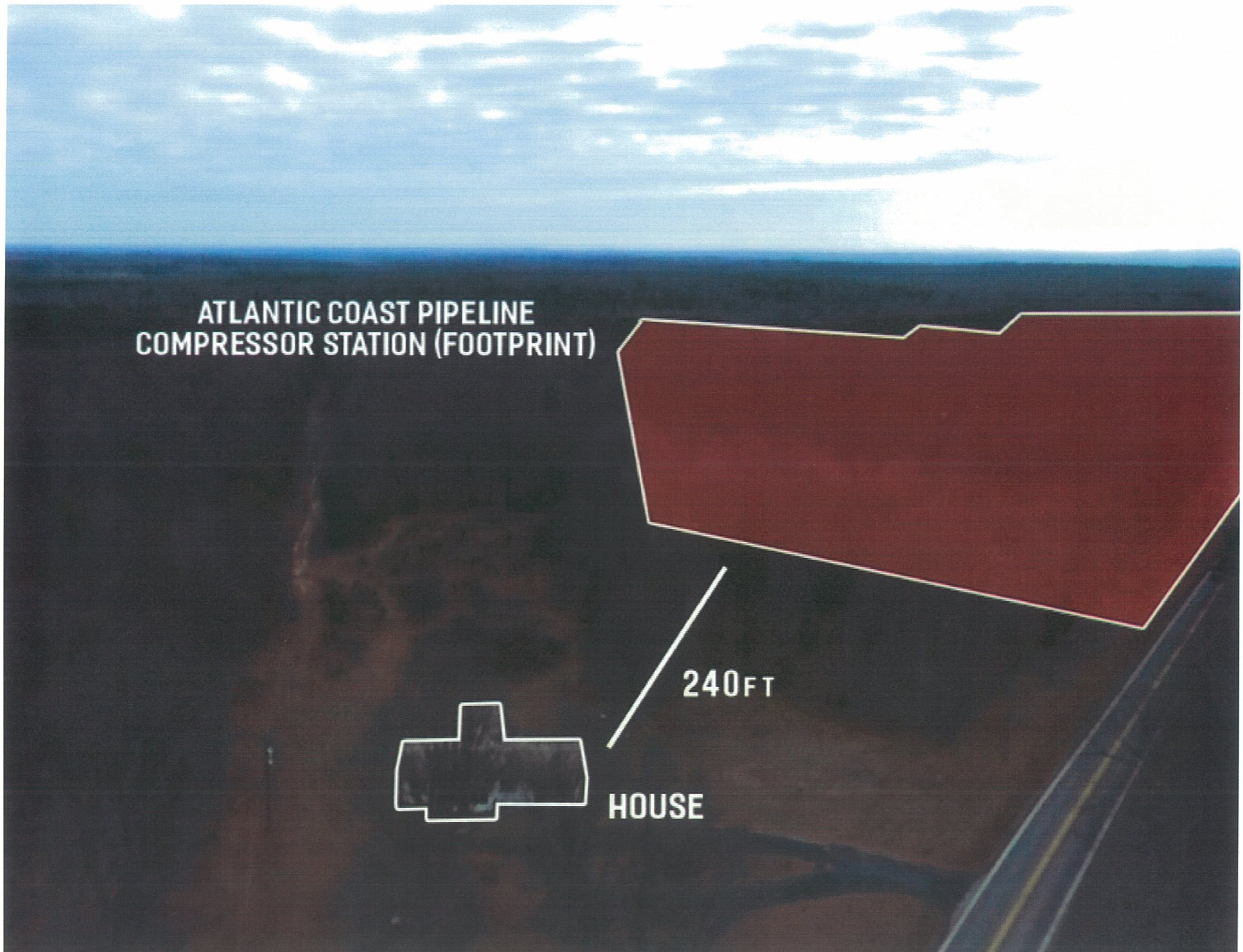
970FT FROM COMPRESS


50FT FROM COMPRESSOR STATION

ATLANTIC COAST PIPELINE
COMPRESSOR STATION (FOOTPRINT)

240 FT

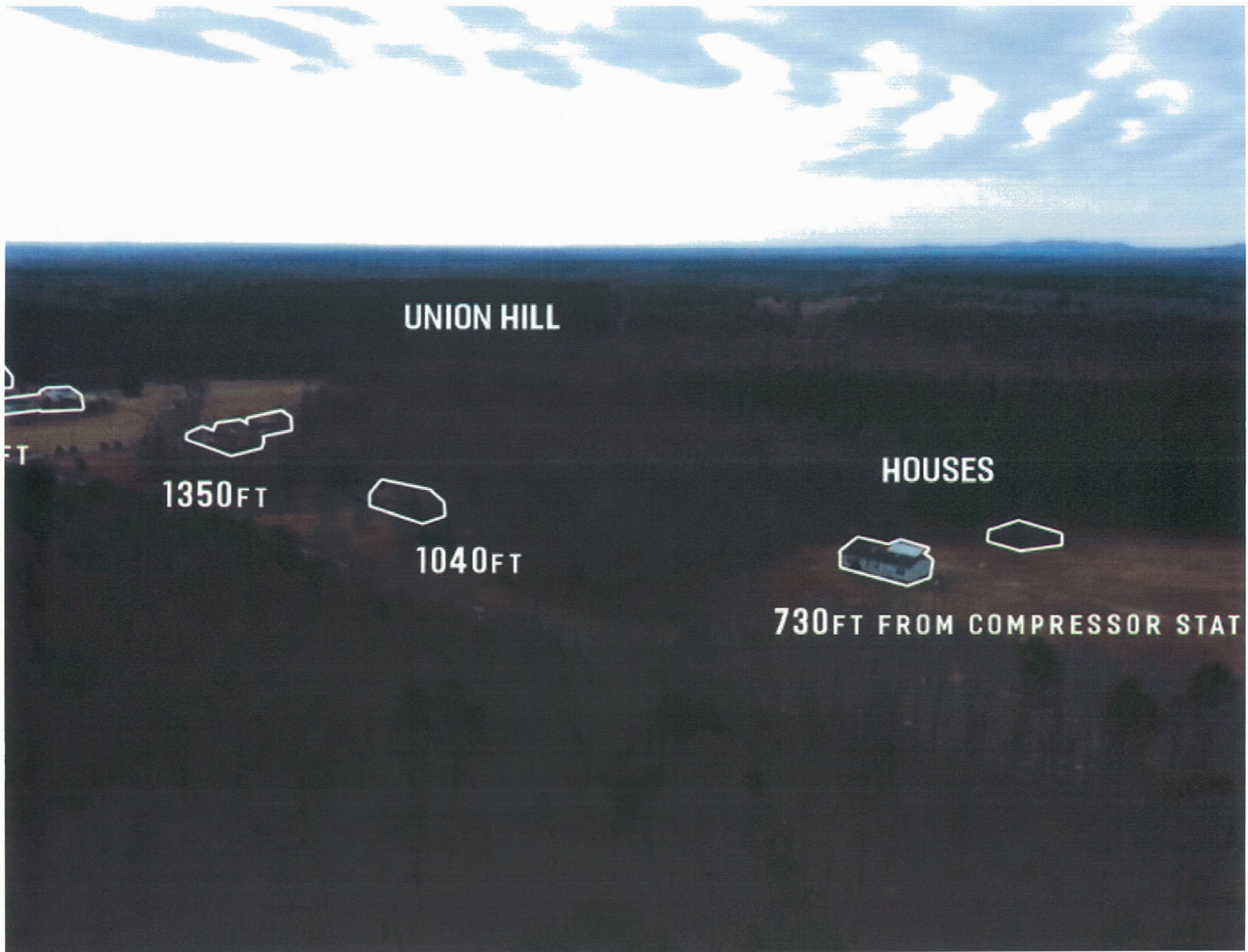
HOUSE





ATLANTIC COAST PIPELINE

An aerial photograph showing a proposed pipeline route, highlighted in a dark, semi-transparent band, winding through a rural landscape. The route starts in the lower left, curves through a field of tall grass and some trees, and extends towards the horizon on the right. The surrounding terrain is a mix of green fields and brownish, cleared land. A road is visible in the bottom left corner. The sky is overcast with grey clouds.



UNION HILL

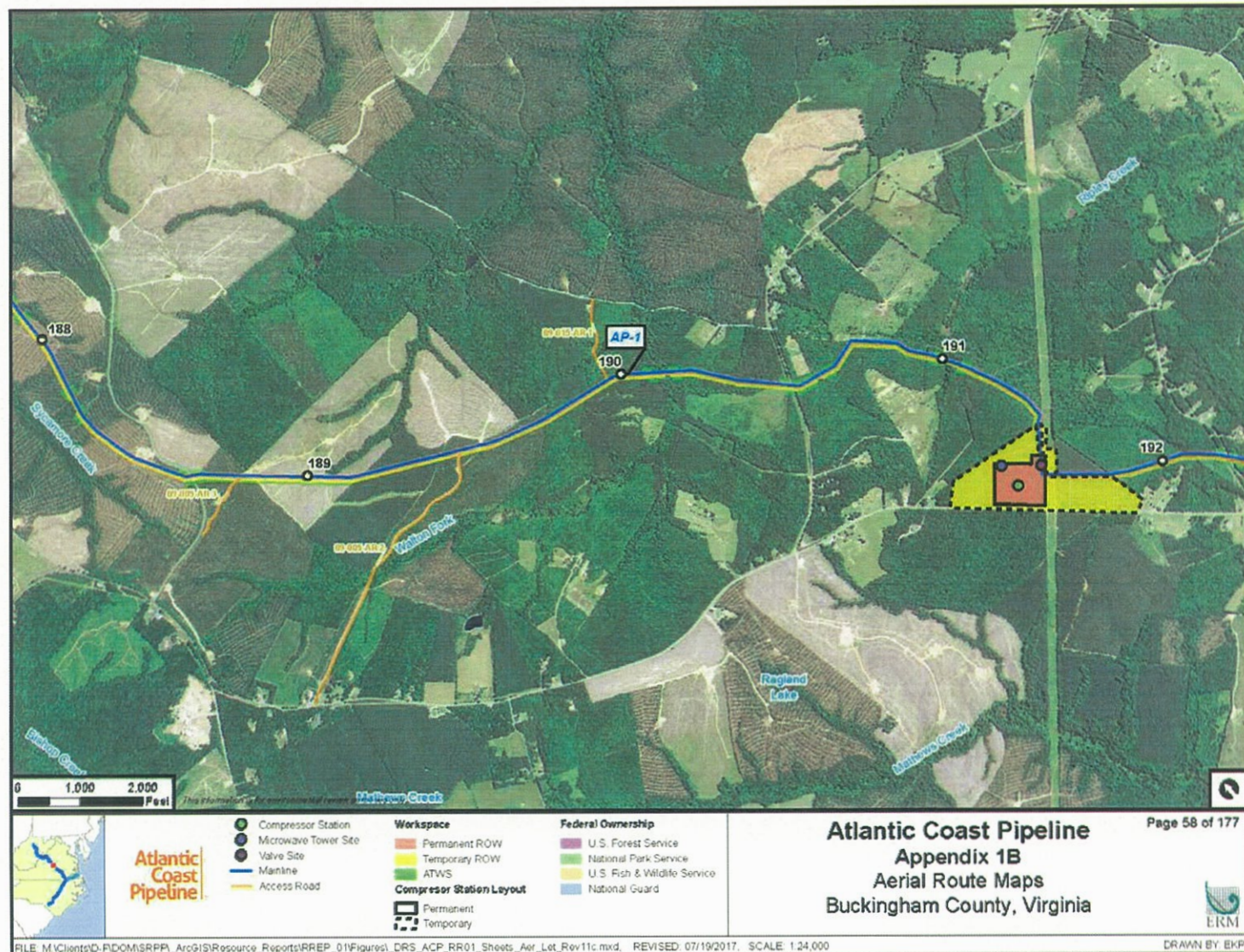
HOUSES

1350FT

1040FT

730FT FROM COMPRESSOR STAT

FIGURE 2.1 BUCKINGHAM COMPRESSOR STATION LOCATION MAP





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Saving a National Treasure

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Alan L. Wurtzel

September 21, 2018

Robert Langford, Chair
Members of the Virginia State Air Board

David C. Paylor, Director
Virginia Department of Environmental Quality
1111 East Main Street
Richmond, VA 23219

Virginia Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Rd
Glen Allen, VA 23060
Emailed to: airdivision1@deq.virginia.gov

Re: Proposed New Source Permit for Atlantic Coast Pipeline, LLC to Construct and Operate a Natural Gas Compressor Station (Registration Number: 21599) located at 5297 S James River Hwy, Wingina, Buckingham County, VA 24599

Dear Chairman Langford, Members of the Board, and Director Paylor:

On behalf of Chesapeake Bay Foundation (CBF), please accept the following comments on the proposed permit. CBF opposes issuance of the permit because:

- Approval of the proposed air permit will harm air quality and public health in violation of the state constitution and the duties of the Board;
- There is no need for a compressor station of the proposed size;
- The terms of the proposed permit are insufficient to protect human health, the environment, and public safety;
- Issuance of the permit would violate the state's obligation to protect its citizens from discrimination;
- The proposed facility will deposit a new, unmitigated load of nitrogen to the Chesapeake Bay in violation of the Bay Total Maximum Daily Load and the State's Watershed Implementation Plan; and
- The permit will allow a new source to emit greenhouse gas pollution into the atmosphere and further contribute to climate change and sea level rise.

The facts and the law supporting our opposition to the proposed permit are discussed below. Appended to these comments are the findings of Ranajit Sahu, Andrew Gray, and Dr. George Thurston. These men are experts in their respective fields of engineering, air pollution modeling and air pollution related health impacts. All three have appeared as expert witnesses on behalf of the United States in litigation against the owners of coal fired electric generating units that violated the federal Clean Air Act such as Dominion, Duke Energy, and subsidiaries of the Southern Company, the owners of the Atlantic Coast Pipeline.¹

In addition to these comments, we adopt the comments submitted by the Southern Environmental Law Center in this matter.

I. The Board is Legally Obligated to Protect the Resources of the Commonwealth and Human Health

In addition to upholding the provisions of the state's clean air laws and regulations, the Board must uphold the terms of Article XI, Section 1 of the Constitution of Virginia which states:

To the end that the people have clean air, pure water, and the use and enjoyment for recreation of adequate public lands, waters, and other natural resources, it shall be the policy of the Commonwealth to **conserve**, develop, and utilize its natural resources, its public lands, and its historical sites and buildings. Further, it shall be the Commonwealth's policy to **protect its atmosphere**, lands, and waters from pollution, impairment, or destruction, for the benefit, enjoyment, and **general welfare of the people of the Commonwealth**.

(emphasis added.).

Governor Northam in his Executive Order Six (2018), acknowledged this constitutional responsibility and stressed the critical role DEQ, and hence this Board, play in protecting Virginia's air, water, and public health. He specifically noted that "many Virginians, particularly those in ... rural low income or minority communities, do not enjoy clean air and water for outdoor recreation and daily activities." Governor Northam acknowledged that "many Virginians suffer from asthma attacks and other respiratory ailments that are directly attributable to poor air quality." He noted further that "[s]cience also shows that carbon pollution and climate change are exacerbating these problems." The Governor recognized the need for "[r]obust monitoring and verification coupled with strong, consistent, and uniform enforcement of our air ... statutes ..." and directed DEQ to undertake a review of its programs to ensure "that DEQ's permitting

¹ <https://www.nytimes.com/2003/04/19/us/utility-to-spend-1.2-billion-to-cut-emissions.html>; <https://www.epa.gov/enforcement/dominion-energy-inc>; <https://www.epa.gov/enforcement/duke-energy-corporation-clean-air-act-caa-settlement>; <https://www.epa.gov/enforcement/alabama-power-company-clean-air-act-settlement>.

programs are as protective of public health and the environment as authorized under state and/or federal law....” DEQ was also directed to assess “the enforceability of permitting activity and determining if changes are needed in the methods DEQ uses in crafting such permits.” As appointees of the Governor, the members of this Board are duty bound to consider the Governor’s findings and directives when acting on behalf of the Commonwealth.

Moreover, the Board is legally obligated when approving permits to consider facts and circumstances relevant to the reasonableness of the activity involved and the regulations proposed to control it, including:

1. The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused;
2. The social and economic value of the activity involved; and
3. The suitability of the activity to the area in which it is located....

Code of VA, Section 10.1-1307(E). Thus, if the air regulations governing the proposed compressor station do not adequately control its emissions, the Board must deny the permit.

As explained below, approval of the proposed compressor station permit will not conserve the natural resources of the Commonwealth nor protect its atmosphere or lands from pollution, impairment and destruction. Moreover, the station will injure public health, risk the safety of neighboring landowners, and interfere with the reasonable use of property owned by neighboring citizens. The social and economic value of the compressor station is offset by the harm it will cause to human health, reasonable property use, and the environment. Further, the location of the proposed compressor station is not suitable to the rural, agricultural nature of Buckingham County. Thus, the Board has the authority to deny the air permit regardless of whether emissions from the station will comply with National Ambient Air Quality Standards.

II. The Proposed Permit Lacks Factual Support and Suffers from Technical Deficiencies

Ranajit Sahu has reviewed the terms of the proposed permit and has found them deficient in several respects. His complete findings are discussed in his report, Exhibit A. A summary of his findings follows:

1. The permit application has not explained why a compressor station of this size is needed. No contracts for gas pumped from Buckingham are identified. There is no need for a new natural gas supply in Virginia. Dominion has said it will not construct any new natural gas fired electric generating plants in Virginia and it has not identified any new demand for natural gas in Chesapeake, Virginia, where the eastern lateral pipeline will run after leaving the compressor station. To ensure that this compressor station is needed in the size permitted, the Air Board should require Dominion to identify the specific industries it intends to supply with gas to, the volume of gas it will distribute

each year, and affirmatively state that it does not intend to export gas as it is doing at its Cove Point, facility in Maryland.²

2. In addition, Dominion has given conflicting reports as to how much pressure is needed to move gas through the pipe. The Final Environmental Impact Statement (FEIS) for the pipeline states that the line pressure will be 1440 psig or approximately 1454.7 psia. Yet the emissions calculations supporting the air permit use both 1400 and 1200 psig. Both the FEIS and the permit calculations cannot be correct. If, in fact, the permit calculations, which use the 1200 psig value, are correct, that means that the “Final” EIS is wrong. The line pressure dictates the size of the compressor stations, including the Buckingham station as well as the two others supporting the pipeline. The conflicting line pressure values given in the EIS and the permit application do not provide confidence in the design of the compressor station or justify the size of the compressor station as proposed.

3. The need for placing the proposed station along the existing Transco gas pipeline (Buckingham is already bisected by a natural gas line owned by Transco)³ is not fully explained. Given the air, land and noise impacts the facility will have, the application should explain why the facility must be placed in close proximity to existing homes like the Laury’s.⁴ Exhibit B.

4. The air pollution models used by Dominion and DEQ consider the size of the compressor turbines to determine the amount of pollutants they will emit and where those pollutants will travel. To accurately run the model, one needs to know the exact size of the turbines to estimate the amount of combustion byproducts emitted by each turbine. However, while the draft permit identifies the size of the turbines, that is not an enforceable term of the proposed permit. The draft permit states: “Specifications included in the above tables [on page 5 of the Draft permit] are for informational purposes only and do not form enforceable terms or conditions of the permit.”⁵ Thus, Dominion is free to alter the size of the turbines at any time and thereby alter the amount of pollution it emits making modelling results inaccurate.

5. The permit contains unenforceable terms. The terms “good air pollution control practices for minimizing emissions,” “maximum extent possible,” “manufacturer’s written protocol,” and “best engineering practices for minimizing emissions” are not defined in the permit. Process Requirement 4, Emission Controls. While some of these terms may be found in the manufacturer’s promotional materials, those documents are not part of the proposed permit and are not enforceable. Application of these terms is left to the discretion of Dominion, not DEQ or citizens who may seek to enforce the terms of the permit in the future. Given their importance to insuring that

² <https://www.reuters.com/article/us-dominion-cove-point-lng/dominion-maryland-cove-point-lng-facility-exports-first-cargo-idUSKCN1GE1SM>

³ Exhibit C, Virginia Places, Natural Gas Pipelines in Virginia maps of existing pipelines.

⁴ See public comments of Ruthie and John Laury, September 12, 2018 public hearing video <https://www.youtube.com/watch?v=jc-pNspQsI> at 31:21- 37:33.

⁵ Draft Permit, p. 6.

pollution emission levels remain low, they must be defined terms within the permit subject to easy comprehension and, if necessary, enforcement.

6. The definition of startup and shut down is too broad and should be narrowed. The permit excuses the operator from running NO_x controls during start-up and shutdown, and the CO/VOC (oxidation catalyst) during start-up. The permit defines start-up as the period beginning with the first fuel fed to the compressor turbine and ending when the turbine reaches 50% load. *Id.* at 4a and b. Similarly, shut down is defined as the period when the turbine drops below 50% load and ends when the fuel feeding stops. Because of the load capabilities of the four turbines, this definition of startup and shutdown means that the compressor station can operate at half of its maximum power output without critical pollution controls in place. DEQ did not provide any support for why 50% is the appropriate upper bound for the end start-up or the beginning of shut down. Consequently, the permit creates a large start-up and shutdown loophole that can simply eviscerate the permit requirements.

The Board should require that permit be revised to require a much smaller load as the end of start-up or beginning or shutdown based upon each turbine's operating characteristics as well as the characteristics of the respective controls and the earliest point they can be engaged.

7. The draft permit impermissibly relies on manufacturer's emissions data to support the permit modeling. In the dispersion modeling, a critical analysis underpinning the entire air permit, Dominion relies on the emissions estimates provided by the turbine manufacturer Solar. But Solar. Solar typically does not warranty emission rates for VOCs, SO₂, or formaldehyde, and expressly does not warrant emissions estimates related to start-up, shutdown, and the commissioning of combustion turbines. But Dominion adopted these emissions estimates whole cloth and made no adjustments to the emissions calculations in its dispersion modeling. The conclusions of that modeling are therefore fatally deficient and will under-predict impacts from the proposed facility.

8. The permit fails to explain why the minimum operating temperature for the catalyst necessary for CO and VOC reduction is 490° F. Process Requirement 4c. The record and permit should adequately support and identify the lowest possible minimum operating temperature of the oxidation catalyst. The record should include the operating characteristics from various vendors of different oxidation catalysts and the permit should require that the oxidation catalyst with the lowest minimum operating temperature be used.

9. The draft permit does not provide sufficient support for the most efficacious operation of the proposed NO_x controls. The four turbines use SCR to control NO_x emissions. However, the control efficiency for this emission reduction technology is stated at 58% by the SCR vendor. Neither the proposed permit nor the vendor indicate why this value was chosen, or why a higher value resulting in lower NO_x emissions could not be attained. Higher reduction rates can be economically achieved. This

assumption is therefore not adequately supported in the draft permit and should be fully evaluated and amended.

10. Process Requirement 6e of the draft permit refers to “sufficient differential pressure”; however, that term is not defined. The permit should provide a numerical value for what is “sufficient differential pressure” for each seal/turbine. Without a numerical value, the Board, VDEQ, and the public can have no assurance that the station will be operated in a manner most protective of air quality and human health.

11. The draft permit allows a repair time for leaking equipment of no later than 5 days after discovery, a leak report does not have to be made to DEQ until 15 days after the leak is discovered, and repairs can last for up to 3 days before shutdown maybe required. Process Requirement 7b. Allowing up to 5 days for a first attempt at repairing a component means large quantities of highly flammable natural gas and other VOCs, to escape into the surrounding atmosphere. In addition to the safety hazard such a release would present to personnel and surrounding residents, it would also allow large amounts of ozone producing and greenhouse gases to be emitted further harming human health and air quality. There is no justification for why the first attempt at repair cannot be made within 24 hours of detection. Further, the maximum time allowed for repair should be no longer than 3 days.

The public should be made aware of all leaks that present a safety or health risk. *See* Condition 36 which requires only annual reporting of compliance. In this digital age where documents, messages and photographs can be transmitted hundreds of miles in seconds, such a relaxed reporting requirement is woefully inadequate. Thorough routine inspections and prompt public notice is essential as the gas is not odorized and leak detection will require close monitoring of all piping. Because of these glaring deficiencies, the Board should require DEQ to revise the permit to require more thorough leak detection monitoring, prompt repair efforts and at least weekly reporting to both DEQ and the public.

12. The draft permit refers to continuous monitoring in several paragraphs (8 - 12) but never identifies continuous monitoring for pollutants emitted from the station. Continuous Emissions Monitors (CEMs) should be required by the permit, not stack testing, Conditions 29 and 31, to verify compliance with all emission limits, Conditions 20 – 23, which only provide a three-hour average of emissions. Exhibit A, pages 8-9. This is especially true as the federal government intends to remove the requirement for such monitors at combustion facilities other than coal fired electric generating units.⁶ To insure the safety of the local population and those downwind, CEMs should be a required monitoring device.

13. The proposed permit provides lax monitoring and reporting requirements for fuel sulfur content, emergency engine operation, and for reporting to the public.

⁶ *See* “Oil industry gets its wish on emissions rule,” Energy Wire, 9-12-18, <https://www.eenews.net/energywire/stories/1060096587>.

Operating Limitations 15 and 16. These requirements should provide clear and emphatic compliance terms with the earliest reporting times.

14. The permit does not contain limits for many air toxic compounds like benzene, naphthalene, and PAHs that will be emitted and thus, implicitly underestimates the potential health risks posed by the facility. Exhibit A, page 9. EPA has identified emissions factors for 10 hazardous air pollutants (HAPs) emitted by natural gas fired stationary gas turbines.⁷ The draft permit only provides permit limits for one, formaldehyde. State Only Enforceable Limit 47. The other HAP identified in the draft permit is hexane.

Remarkably, the permit does not require specific monitoring to determine compliance with the limits for hazardous air pollutants. The draft permit merely states that compliance with the emissions limits “may be determined” in accordance with one of eight different conditions. Thus, compliance with the only HAP limitations in the permit is not assured. Accordingly, the draft permit does not insure public health or safety.

The Board should deny the permit and require DEQ to:

- (i) properly estimate the quantities of all air toxic compounds that will be emitted from the facility including from the four turbines as well as the fugitive non-combustion sources;
- (ii) require testing and verification of the emissions estimated in (i) above on a periodic basis; and
- (iii) conduct a health risk assessment, using conservative assumptions, to quantify the health impacts of such emissions on the population near the proposed station and confirm that the incremental health risks are not unacceptable.

15. The facility will emit the toxic gases formaldehyde and hexane. Given the generating capacity of the station, the impacts due to hexane and formaldehyde emissions are likely to be significant; however, the draft permit does not adequately address these impacts. The modeling underestimates the level of hexane and formaldehyde emissions released from the compressor station. For hexane, in particular, the line pressure is an important assumption for determining emissions, and the FEIS and application provide inconsistent values for line pressure. The application likely under-predicts the actual emissions and impacts of these harmful toxic air contaminants. The Board should require DEQ to further evaluate and model the expected impacts of formaldehyde and hexane on station employees and residents and propose revised permit terms for public notice and comment.

16. The draft permit does not include estimates of greenhouse gases that will be emitted from the facility. That neither the permit application, DEQ’s analysis nor the proposed permit consider the significant quantity of greenhouse gases that will be emitted by the station each year is astounding. This is especially true when the Governor has

⁷ Available at <https://www3.epa.gov/ttn/chief/ap42/ch03/index.html> Stationary Gas Turbines, Vol. 1, table 3.1-3. One HAP, 1,3-butadiene, was not detected.

specifically acknowledged the threat all Virginians face from climate change and sea level rise.⁸ In fact, the Governor has directed DEQ, and consequently this Board, to develop carbon trading regulations which DEQ has done.⁹ Promulgation of those regulations will allow Virginia to join the Regional Greenhouse Gas Initiative whose focus is to cap and reduce power sector CO2 emissions.¹⁰ Hence, to ignore the impact this facility will have on our atmosphere due to the emission of thousands of pounds of greenhouse gases annually is to ignore the directives of the Governor and this Board's legal obligations, Const. of VA Article XI, Section 1; Code of Virginia Section 10.1-1307(E).

17. The draft permit does not estimate emissions from accidental threats and thus does not estimate potential human health and environmental impacts associated with such events. In recent months, several pipelines and compressor stations have exploded harming and killing residents. Neither the application nor DEQ's analysis evaluates the potential for such accidents, the threat they pose to surrounding residents and workers, or the amount of air pollution such an event might generate. The Board should require DEQ to undertake such an analysis and report to the public and the Board before the Board considers approval of the permit.

18. The application and draft permit do not contain any analysis of the downwind ozone impacts to human health due to emissions of NOx (and VOCs) from the facility. Thurston, Exhibit E, discussed below. NOx and VOCs in the presence of sunlight generate ground level ozone, a human health threat. This facility will generate thousands of pounds of these compounds annually. No analysis has been undertaken to determine what impact these emissions will have on downwind areas that are already in nonattainment for ozone. In Virginia, the following areas are in violation of both the 2008 and 2015 eight-hour ozone standard: Alexandria City, Arlington County, Fairfax County, Fairfax City, Loudoun County, Manassas Park City, Manassas City, and Prince William County.¹¹ Thus, the Board has no information upon which to determine whether and by how much this new source of NOx and VOCs will contribute to ozone nonattainment in these downwind areas of Virginia, not to mention those areas in neighboring jurisdictions. Before considering the draft permit, the Board should require Dominion or DEQ to provide that information.

19. The application and draft permit do not contain any analysis of the amount of nitrogen that will be deposited in the Chesapeake Bay due to NOx emissions from the station in violation of the Chesapeake Bay TMDL. *See*, below. Such an analysis should be undertaken before the Board considers approval of the draft permit.

⁸ <https://www.governor.virginia.gov/newsroom/all-releases/2018/september/headline-829610-en.html>

⁹ <http://www.townhall.virginia.gov/L/ViewStage.cfm?stageid=8130>

¹⁰ <https://www.rggi.org/program-overview-and-design/elements>

¹¹ <https://www3.epa.gov/airquality/greenbook/hnca.html> (2008); <https://www3.epa.gov/airquality/greenbook/jnca.html> (2015).

20. The draft permit does not contain any analysis of the secondary PM_{2.5} impacts due to emissions of NO_x (and SO₂) from the facility. *See* Thurston, below. Such an analysis should be undertaken before the Board considers approval of the draft permit.

21. The analysis of ozone and secondary PM 2.5 using the Modeled Emissions Rates of Precursors (MERP) approach is deficient. The MERP approach models hypothetical industrial sources with other similar source characteristics and emissions rates from different sources located in similar atmospheric environments. Dominion modelled the Buckingham compressor station using model results from EPA Source 9 located in Dinwiddie County, VA. NO_x, SO₂, and VOC emissions from this hypothetical source have been assumed to be 500 tons/year each (as compared to the estimated 34.2 tons/year of NO_x, 8.3 tons/year of SO₂ and 9.77 tons/year of VOC emissions for the compressor station). Given the disparate sizes of the modeled source and the compressor station, the different release profiles, the dissimilar air sheds into which the precursor emissions are emitted, the MERP approach used in support the proposed permit to discount the formation of ozone and secondary PM_{2.5} from the compressor station is unreliable. DEQ should require direct modeling of these impacts prior to approving a proposed permit.

By law, the Board and DEQ may only approve permits that contain clear and enforceable terms. 42 U.S.C. § 7661c. Because the draft permit is not sufficiently supported by the record and contains undefined terms and conditions, it is facially deficient. Thus, the proposed permit should be rejected, significantly modified, and resubmitted for public notice and comment.

III. The Proposed Facility, as Permitted, Will Emit Massive Amounts of Harmful Air Pollutants

Andrew Gray has reviewed the emissions and air modelling data submitted by Dominion in support of its permit application and DEQ's analysis of that data. He has conducted his own modeling analysis which is attached as Exhibit D.

Dominion admits in its applications that this facility will emit into the atmosphere each year thousands of pounds nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), particulate matter (PM), sulfur dioxide (SO₂), and carbon dioxide (CO₂) in addition to pounds of toxic gases.

Project Emissions Annual Emissions (tons per year)

	NOX	CO	VOC	PM	SO2	CO2e
Application Update (2017)	46.1	86.4	32.1	43.3	7.26	317,637
Proposed Update (2018)	34.3	51.6	7.69	43.2	8.30	295,686

Revised application table1.1 Dominion Application update May 25, 2018.

As Mr. Sahu states in his report, the CO, CO₂, and NO_x will contribute to climate change and sea level rise in the Commonwealth.

Further, according to Mr. Gray's analysis, NO_x emitted from the Buckingham Compressor station will deposit more than 2,500 kilograms of nitrogen to the Chesapeake Bay Watershed with the bulk of that nitrogen falling in Virginia. Exhibit D. Over 27 kilograms will fall each year directly into the Chesapeake Bay. More nitrogen will be deposited to tributaries to the Chesapeake Bay like the Pamunkey River and Dragon Run. *Id.* That nitrogen will be a new, unmitigated load that will contribute to excess nitrogen in the Chesapeake Bay. As discussed below, this nitrogen impact was not addressed by Dominion in its application materials or by DEQ.

In addition, the proposed plant will emit 43 tons of particulate matter (PM) each year. *See* chart above. As explained below and in greater detail in Dr. Thurston's report, Exhibit E, fine particulate matter (PM_{2.5}) generated by fossil fuel combustion will have an adverse impact on human health in the Union Hill community, Buckingham County, Virginia, and the region. Because the state, regional, and global environmental and human health impacts of CO, CO₂, NO_x, PM, VOCs and toxic gases generated by the plant were not fully evaluated by Dominion in its applications or by DEQ, the permit should be denied.

As noted above, in its air modeling Dominion used AERMOD in a screening mode (the MAKEMET meteorological dataset), in which the source and receptors are defined completely but the meteorological data are not actual/observed data, but rather represent a "worst-case" scenario. The screening mode only provides estimates of hourly impacts. The thinking behind this approach is that if the Project does not violate the NAAQS using the screening approach, then the Applicant would not need to gather five years of actual meteorological data to demonstrate compliance. The screening approach is adequate if the results are definitive and a project's emissions are without question below the NAAQS. However, if the screening results are close to the NAAQS limits (as was the case with three of the six modeled compressor stations for the 1-hour NO₂ NAAQS), *and* if any of the assumptions regarding the source data are significantly in error *or* the assumed background level is chosen inappropriately, then the results of the screening approach may not accurately reflect the NAAQS attainment status for the modeled sources.

Background levels are supposed to represent the contributions from all other emissions sources and the regional background for the NAAQS limit. The assumed background level can have a significant effect on the modeled results (*e.g.*, attainment vs. non-attainment), especially if the background levels are not far below the NAAQS (*i.e.*, even a relatively modest-sized additional source would trigger a violation). Examination of the assumptions regarding the selection of background levels for each of the NAAQS standards reveals that there is at least some uncertainty regarding the value for the 1-hour NO₂ NAAQS at the Buckingham compressor station.

According to the Air Quality Model Results for the Project (using the AERMOD screening mode), the 1-hour NO₂ values at the Buckingham location (modeled source impact plus assumed background) is greater than 150 ug/m³; the 1-hour NO₂ NAAQS standard is 188 ug/m³. Because these modeled concentration is close to the 1-hour NO₂

NAAQS standard, the Board should require DEQ to conduct a careful examination of (a) the appropriateness and/or representativeness of the assumed background levels and (b) the assumptions regarding the data used for the MAKEMET "worst-case" screening data. In addition, the AERMOD modeling of the Project should be conducted using actual meteorological data (instead of screening mode) to determine local NO₂ concentration impacts and to demonstrate attainment with the 1-hour NO₂ NAAQS.

IV. Operation of the Compressor Station Will Harm Human Health

Dr. George Thurston has evaluated the PM and ozone (O₃) emissions projected to be generated by operation of the proposed compressor station. Exhibit E. Dr. Thurston is Director of the Program in Exposure Assessment and Human Health Effects at the New York University School of Medicine. He published the first research establishing an association between exposure to PM_{2.5} and mortality. Among other things, Dr. Thurston has served as a member of the EPA's Clean Air Science Advisory Council and is the Chair of the Environmental Health Policy Committee of the American Thoracic Society. *Id.* at 1-2.

Dr. Thurston's report summarizes the research establishing that PM_{2.5} harms human health. Those health effects include, decreased lung function, more frequent asthma symptoms, increased asthma and heart attacks, more frequent hospital visits, increased deaths, and shortening of life expectancy. *Id.* at 3-12. Dr. Thurston opines that any increase in air pollution will increase the risk of adverse effects, even when the NAAQS are not violated. *Id.* at 13-17. Dr. Thurston also notes that neither Dominion nor DEQ have evaluated the increased risk of harm associated with fine particles in conjunction with acidic gases like those that will be emitted by the station. *Id.* at 18-21. Thus, Dr. Thurston disagrees with the Supplemental Report's conclusion that "emissions from the proposed BCS will result from combustion of clean burning natural gas; in no case, will the emissions cause air quality to exceed regulatory standards, which are protective of human health and the environment." *Id.* at 21.-22

Dr. Thurston also discusses the adverse health effects of ozone, a pollutant that irritates the human lung in the same manner as it eats way rubber. *Id.* at 22-23. Thus, ozone has a significant adverse impact on those with asthma and may aggravate chronic lung diseases like emphysema and bronchitis. *Id.* at 23-25. Ozone also causes increased morbidity due to these harmful lung impacts. *Id.* at 26-29.

Based upon his research, and that of others, as well as his evaluation of the application and DEQ's analysis, Dr. Thurston concludes that, with respect to PM, adverse human health effects of long-term (annual) exposures to PM_{2.5} at these locations will rise by at least 21%, while the adverse human health effects of short-term (24-hr) exposures to PM_{2.5} will rise by at least 44%. *Id.* at. 31.

Further, emissions from the proposed plant will cause an increase in the risk of adverse health effects among those who breathe that pollution, and especially for the socio-economically disadvantaged populations living within the most affected areas immediately surrounding the facility. In addition, the proposed facility's emissions of

NOx will also contribute to the increases in health risks from added local air pollution, as well as to the downwind formation of, and exposures to, ozone air pollution, and to associated downwind increases in adverse human health effects caused by those incremental ozone exposures. Thus, this proposed facility will have both local and downwind adverse human health consequences and should not be permitted as proposed.

V. Construction and Operation of the Compressor Station Will Violate Concepts of Environmental Justice

The proposed location of the compressor station is adjacent to State Route 56, South James River Road, near Woods Corner in Buckingham County, Virginia. Exhibit F, maps and aerial photos. The compressor station will occupy 21 acres of forest land that will be destroyed during construction.¹² Dominion seeks to place the station there, so it can tie the ACP and Transco pipelines together. The area around the proposed compressor station is a minority community comprised of modest homes, forest, and open fields. The area of Union Hill is already bisected by the Transco natural gas line that runs through the county northeast to northwest. Exhibit G.

Buckingham County is the geographic center of the Commonwealth. Its economy is based on agriculture and extraction businesses like logging. It has no major industrial facilities except four slate and three timber companies.¹³ According to the latest census data, the median household income is \$43,514 with 17.6% of the population living in poverty.¹⁴ The county is over 33% African American; however, the area surrounding the compressor station is predominately African American. *See* house to house survey of Friends of Buckingham cited in SELC comment letter.

Numerous residents surrounding the proposed compressor station site are descendants of freed slaves, many of whom worked on and may have been buried on a plantation known as Variety Shade – a portion of which is the site of the compressor station.¹⁵ No one has determined whether slaves were buried on the compressor station site. Given the nature of these claims, regardless of whether the Board approves the proposed air permit, such an assessment should be made before construction begins.

The citizens of Buckingham have repeatedly provided oral and written comments in opposition to the pipeline and the compressor station yet DEQ has failed to consider their legitimate concerns or evaluate those concerns in the context of Article XI, Section 1 of the Constitution of Virginia or Code of VA § 10.1-1307(E). The recordings of

¹² *See* video of station site and surrounding community, Transco pipeline.
<https://vimeo.com/272548843>

¹³ http://virginialmi.com/report_center/community_profiles/5104000029.pdf at page 23.

¹⁴ <https://www.census.gov/quickfacts/fact/table/buckinghamcountyvirginia/PST045217>

¹⁵ *See* White, Charles W., *The Hidden and the Forgotten: Contributions of Buckingham Blacks to American History*, Lamp-Post Publicity 2017, p. 321.

DEQ's pre-hearing meeting with local leaders as well as the public hearing on September 12, 2018 identify the serious concerns of numerous residents.¹⁶

During the September 12 public hearing, the comments of Ruthie and John Laury, (Part 1 at 31:21- 37:33) whose retirement home would be mere yards away from the proposed station, highlighted the fear many other residents voiced. *Id.* Ms. Laury spoke to the rural nature of the county and their land. She noted that the industrial nature of the compressor station is not representative of the area they moved to live out their years. Mr. Laury expressed concern for his health and that his wife. He noted that there is no information about the long-term health effects associated with operation of the station. However, based upon Dr. Thurston's report, Mr. Laury was exactly right when he said that any pollution above what they are exposed to right now, will be harmful to their health.

Former Governor of Virginia McAuliffe created an environmental justice advisory council. Executive Order 73 (2017). The EO states that Const. of VA, Article XI, Section 1 recognizes that it is the Commonwealth's policy to "protect its atmosphere, lands, and waters from pollution, impairment, or destruction, for the benefit, enjoyment, and general welfare of the people of the Commonwealth." The EO further recognizes that the protection of our natural resources should apply equally to all individuals; however, some environmental impacts are compounded or concentrated as the result of demographic factors. The consideration of those factors in siting and permitting polluting facilities is known as environmental justice.

DEQ defines Environmental Justice as:

Equal protection from environmental hazards for individuals, groups, or communities regardless of race, ethnicity, or economic status. This applies to the development, implementation, and enforcement of environmental laws, regulations, and policies, and implies that no population of people should be forced to shoulder a disproportionate share of negative environmental impacts of pollution or environmental hazard due to a lack of political or economic strength levels.¹⁷

Environmental justice is defined by EPA as the fair treatment and meaningful involvement of all people regardless of race, color, faith, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.¹⁸ The agency recognizes that it is important that no segment of

¹⁶ September 12, 2018 public hearing video, part 1

<https://www.youtube.com/watch?v=jc-pNspQsI>; part 2

<https://www.youtube.com/watch?v=6bLYE49cQxg&feature=share>; part 3

<https://www.youtube.com/watch?v=DpiQnuHS1qI>.

¹⁷ <https://www.deq.virginia.gov/Resources/Glossary/GlossaryE.aspx>

¹⁸ <https://www.epa.gov/environmentaljustice/learn-about-environmental-justice>

the population, especially individuals most impacted and vulnerable, bear disproportionately high or adverse effects from pollution.

As the proposed facility will emit pollutants that will adversely affect the health of local residents who are predominately minorities, the Board should comply with EO 73, DEQ's Environmental Justice policies as well as those of US EPA and deny the proposed permit.

The NOx Emissions from the Compressor Station Will Represent an Illegal New Load of Nitrogen to the Chesapeake Bay

The proposed compressor station is located within the Chesapeake Bay airshed.¹⁹ The Environmental Protection Agency's Chesapeake Bay Program identified atmospheric deposition of nitrogen as the highest nitrogen input load to the Chesapeake Bay watershed.²⁰ Atmospheric nitrogen comes from nitrogen oxides (NOx) and ammonia (NH3). The principle sources of NOx are air emissions from industrial-sized boilers and internal combustion engines, such as the compressor station's four engines.

Using compressor station information provided in the air permit application and the CALPUFF²¹ air modeling system, CBF estimates that the station would contribute an additional 13,297 pounds of nitrogen deposition per year to the land and water within the Chesapeake Bay watershed. Exhibit D. Of this total, the James River watershed will receive an estimated 4,213 pounds of nitrogen deposition per year. The James River watershed—like all sub-watersheds within the Bay watershed—is subject to specific nitrogen allocations in the Bay TMDL.²² The Bay watershed jurisdictions are responsible for meeting these nitrogen allocations and this additional load of nitrogen pollution must be accounted for and managed by each jurisdiction.

The Chesapeake Bay TMDL accounted for all existing sources of nitrogen in the watershed and established pollution caps that are maintained through implementation of each state's Watershed Implementation Plan (WIP); offsets are required for new sources. Neither Dominion nor DEQ have considered the nitrogen impacts to state waters associated with NOx emissions from the proposed facility. No direct, indirect, or

¹⁹ Emma Andrews, *Map: Chesapeake Bay Airshed*, CHESAPEAKE BAY PROGRAM (Feb. 7, 2008), http://www.chesapeakebay.net/maps/map/chesapeake_bay_airshed

²⁰ Chesapeake Bay TMDL, App'x L: Setting the Chesapeake Bay Atmospheric Nitrogen Deposition Allocations, L-1 (2010), https://www.epa.gov/sites/production/files/2015-02/documents/appendix_l_atmos_n_deposition_allocations_final.pdf

²¹

https://www3.epa.gov/ttn/scram/7thconf/calpuff/Previous_SCRAM_CALPUFF_Posting_Reference.pdf

²² See Chesapeake Bay TMDL, Section 9. Chesapeake Bay TMDLs, "Table 9-1. Chesapeake Bay TMDL total nitrogen (TN) annual allocations (pounds per year) by Chesapeake Bay segment to attain Chesapeake Bay WQS," at 9-4 (2010), *available at* https://www.epa.gov/sites/production/files/2014-12/documents/cbay_final_tmdl_section_9_final_0.pdf.

cumulative impacts analysis has been performed for the Chesapeake Bay watershed or any subwatershed. Because Virginia is a signatory to the 2014 Chesapeake Bay Agreement which states that the federal and state governments will attain the goals of the Chesapeake Bay TMDL, is it obligated to undertake these analyses before issuing a permit for a new source of nitrogen to the Chesapeake Bay. As that has not occurred, the Board must deny the proposed permit.

Conclusion

The proposed air permit is deficient in numerous ways; from its failure to require clearly defined and enforceable terms and its failure to fully evaluate human health impacts to its failure to consider the impacts of emissions from the plant on the minority community and the Chesapeake Bay. Thus, in adherence to the Constitution of Virginia and Virginia law, the Board should deny the permit or, at the least, require that it be severely modified to consider the deficiencies discussed above and re-noticed for public comment.

Sincerely,

A handwritten signature in black ink, appearing to read "Rebecca Tomazin". The signature is fluid and cursive, with the first name "Rebecca" and last name "Tomazin" clearly distinguishable.

Rebecca Tomazin
Virginia Executive Director
Chesapeake Bay Foundation



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Patricia Myers <Patricia.Myers.115356496@p2a.co>

Fri, Sep 21, 2018 at 4:20 PM

Reply-To: cadyldy@comcast.net

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a "minor" source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to "minor" sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Patricia Myers
[677 Gloria Pl](#)
[Staunton, VA 24401](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Public Comment: I Oppose the Buckingham Compressor Station Air Permit1 message

leslee.nicholas@gmail.com <leslee.nicholas@gmail.com>

Fri, Sep 21, 2018 at 10:20 PM

Reply-To: leslee.nicholas@gmail.com

To: airdivision1@deq.virginia.gov

Dear Ms:

I'm writing today to urge the Air Pollution Control Board to reject the proposed permit for Dominion Energy's Buckingham Compressor Station.

This facility is a threat to our climate, public health and public safety, and the Board has an obligation to protect Virginians' clean air at all costs.

A vote to allow operation of this facility is a vote to expose residents of Union Hill to nearly 140 tons per year of harmful chemical emissions; it is a vote to increase climate disrupting greenhouse gas emissions at a time when Virginia is moving to decrease climate impacts from the power sector; and it is a vote to put Buckingham County in a blast zone.

Virginia doesn't need the Atlantic Coast Pipeline and we don't need this compressor station. I urge the Board to deny this and any future permits that come before you.

Sincerely,

Leslee Nicholas
5621 Woody ct
Virginia Beach, VA 23464-6727



Air Division 1, rr <airdivision1@deq.virginia.gov>

ACP's Union Hill Compressor Station public comments1 message

anthony noerpel <anoerpel@outlook.com>

Fri, Sep 21, 2018 at 1:44 PM

To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>, "michael.dowd@deq.virginia.gov" <michael.dowd@deq.virginia.gov>, "patrick.corbett@deq.virginia.gov" <patrick.corbett@deq.virginia.gov>

My summary concerning why society cannot afford to build more fossil fuels infrastructure. It is not what you are looking for, but it is what you might wish to consider. It is not simply about air quality, which by itself is reason not to build this compressor station, but about quality of life for all of us, and future generations and the biosphere. We have a lot of responsibility which we (all of us actually) are shirking.

"What frustrates me is with all this knowledge and all this information, we still collectively refuse to act. I don't understand how we can all be so lacking in courage when we all can clearly see this is a train wreck happening in slow motion." Jay Garetson, Kansas farmer [James]

"What we have to understand is that free will is our capacity to see probable futures, futures which seem like they're gonna happen, in time to take steps so that something else happens instead." - Daniel Dennett

So it comes down to courage and free will.

We've known about this problem for 53 years and ignored it. We should not expect easy solutions or pretend we aren't causing a catastrophe.

We have a 5% chance for 2015 Paris Accord limit of 2 degrees K warming over preindustrial.

Human-caused climate change has been detectable for several decades.

We are beyond the point where we can avoid serious negative impacts.

We are very close to exceeding dangerous tipping points where we lose control of the climate

We have overbuilt fossil fuels infrastructure. We have to strand 50% of existing fossil fuels assets such as existing pipelines. It makes no sense to build even more such infrastructure

If we do shut down 50% of all existing fossil fuels infrastructure in order to comply with the Paris agreement without accounting for existing investment, we will cause a credit crisis greater than the 2008 crisis.

Natural gas does not replace coal. It is not a transition fuel

Solution Summary:

international regulation, standards and a moratorium on all new fossil fuels infrastructure investment. Supply Side regulation.

Invest in sustainable solutions

Modify social norms.

Background: my expertise, methane leakage, civilization at risk, paleoclimate analog, misc.

If you would like to discuss climate change, please feel free to call.

Best Regards

Tony Noerpel

540-882-3289,

Lovettsville, Virginia

Sent from [Mail](#) for Windows 10



DEQ no compressor station.pdf
2163K

Agenda

- My expertise (Background)
- Historical context the Earth system (Background)
 - Extinction events Earth history
 - Implications for sixth extinction, End Anthropocene
- **Why we cannot build more fossil fuels infrastructure.**
- Climate change and the course of human history (Background)
 - Risk to civilization
- What can we do? (Background)

Executive Summary (argument against new pipelines)

- We've known about this problem for 53 years and ignored it. We should not expect easy solutions or pretend we aren't causing a catastrophe.
- We have a 5% chance for 2015 Paris Accord limit of 2 degrees K warming over preindustrial.
- Human-caused climate change has been detectable for several decades.
 - We are beyond the point where we can avoid serious negative impacts.
 - We are very close to exceeding dangerous tipping points where we lose control of the climate
- We have overbuilt fossil fuels infrastructure. We have to strand 50% of existing fossil fuels assets such as existing pipelines. It makes no sense to build even more such infrastructure
 - If we do shut down 50% of all existing fossil fuels infrastructure in order to comply with the Paris agreement without accounting for existing investment, we will cause a credit crisis greater than the 2008 crisis.
- Natural gas does not replace coal. It is not a transition fuel
- Solution Summary:
 - international regulation, standards and a moratorium on all new fossil fuels infrastructure investment. Supply Side regulation.
 - Invest in sustainable solutions
 - Change social norms.
- Background: my expertise, methane leakage, civilization at risk, paleoclimate analog, misc.

Prelude 50 years of excuses

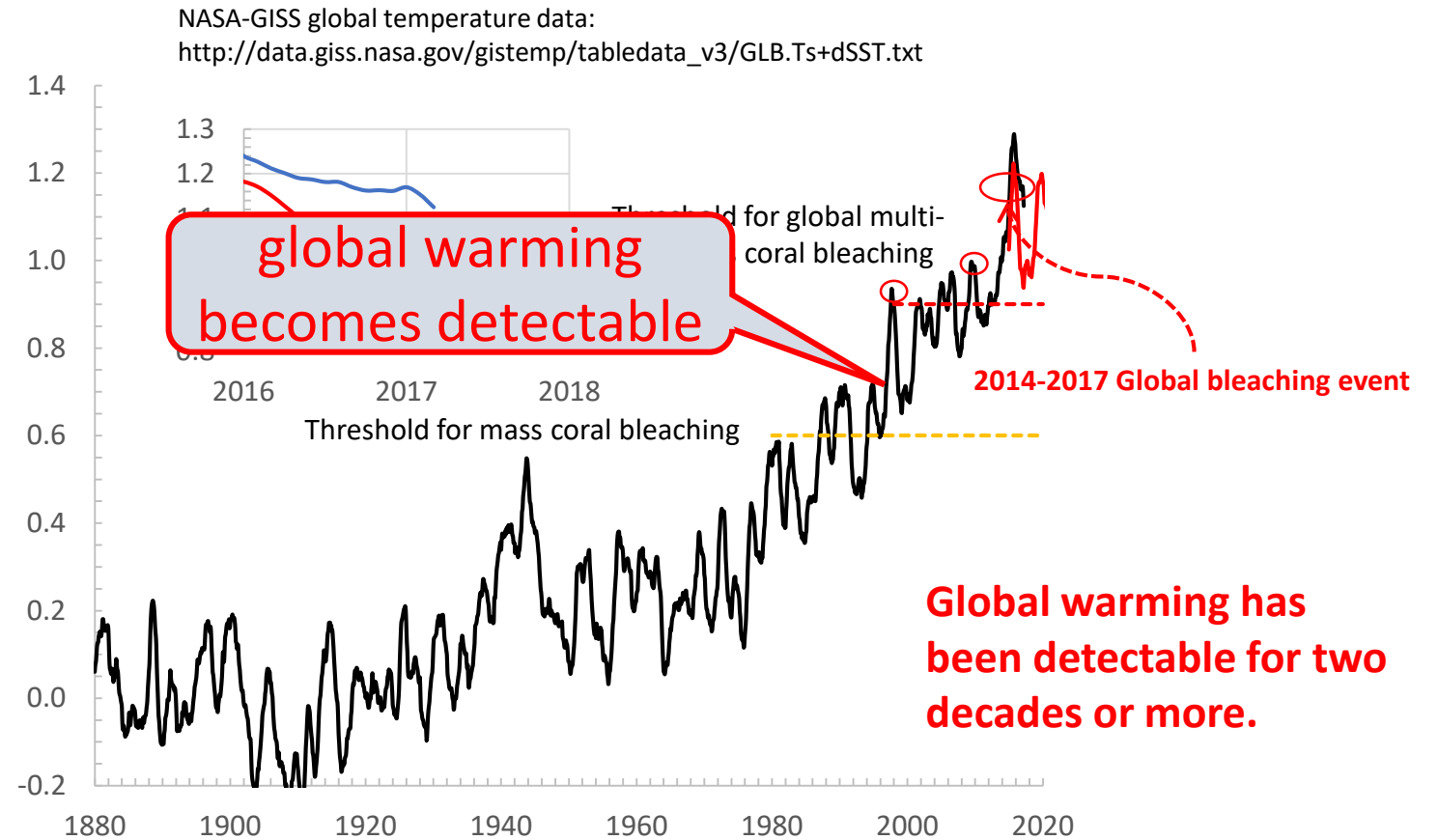
- *“This generation has altered the composition of the atmosphere on a global scale ... through steady increase in carbon dioxide from the burning of fossil fuels.”* - President Lyndon Johnson, message to congress in 1965,
- Carbon tax proposed by David Gordon in 1972, but not politically feasible since conservatives have taken an oath never to pass one. A tax cannot be revenue neutral. Society needs revenue to invest in sustainable infrastructure. Cap and trade solutions were first investigated by the EPA between 1967 and 1970 and proposed to congress in 1972 <http://www.atr.org/about-grover>
https://en.wikipedia.org/wiki/Carbon_tax
https://en.wikipedia.org/wiki/Emissions_trading
- In 1975, Wally Broecker wrote a [paper](#) for the journal Science [1] with the title *“Climatic change; are we on the brink of a pronounced global warming.”*
- The US is the only country in the world withdrawn from the 2015 Paris Climate Accord.

NASA Earth Surface Temperature Anomaly relative to 1880-1910 Average and Shell Scientists warn

In The Greenhouse Effect, a 1988 internal report by Shell scientists, the authors warned that “**by the time the global warming becomes detectable it could be too late to take effective countermeasures to reduce the effects or even to stabilise the situation**”. -

<https://www.independent.co.uk/news/business/news/shell-predicted-climate-change-fossil-fuel-industry-1980s-global-warming-oil-a8294636.html>

This is identical to James Hansen's 1988 Congressional Testimony



Source: http://data.giss.nasa.gov/gistemp/tabledata_v3/GLB.Ts+dSST.txt

2015 Paris Accord Outcome Probability

“The likely range of global temperature increase is 2.0–4.9 °C, with median 3.2 °C and a 5% (1%) chance that it will be less than 2 °C (1.5 °C).” (based on national pledges at 2015 Paris Climate Accord)

Adrian E. Raftery, Alec Zimmer, Dargan M.W. Frierson, Richard Startz and Peiran Liu, Less than 2 °C warming by 2100 unlikely, Nature Climate Change, 31 July 2017, DOI: 10.1038/NCLIMAT

Add 10 GtC deforestation

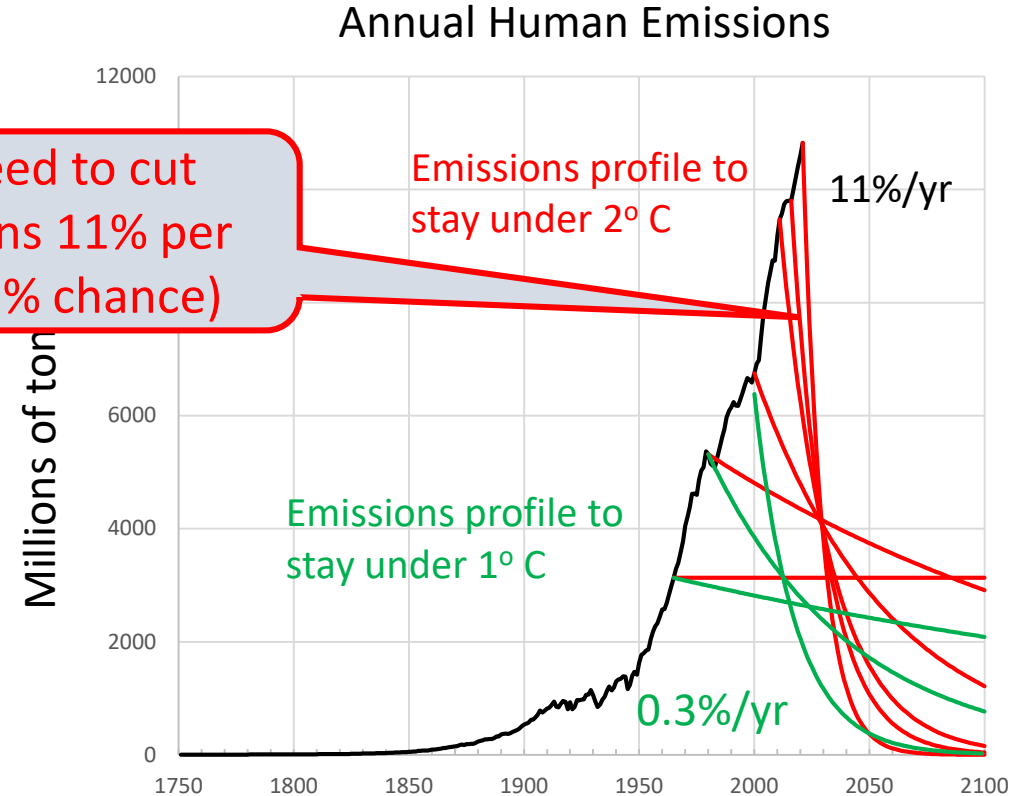
60 GtC wetlands and permafrost

Source for historic data:

Assume no negative emissions, no BECCS, no geoengineering.

Consistent with recent California goal to be fossil fuel free by 2045

We need to cut emissions 11% per year (5% chance)



It is already “too late to take effective countermeasures to reduce the effects” such as climate related events.

The black curve is the increase in Geophysical events including Earthquake, tsunami, volcanic activity relative to the base period in percent. The Blue curve is the increase in Meteorological events including Tropical storm, extratropical storm, convective storm, local storm events. The Green Curve is the increase in Climatological events including Extreme temperature, drought, wildfire. Finally, the red curve is the increase in Hydrological events including Flood, mud slides. All data is for worldwide events.

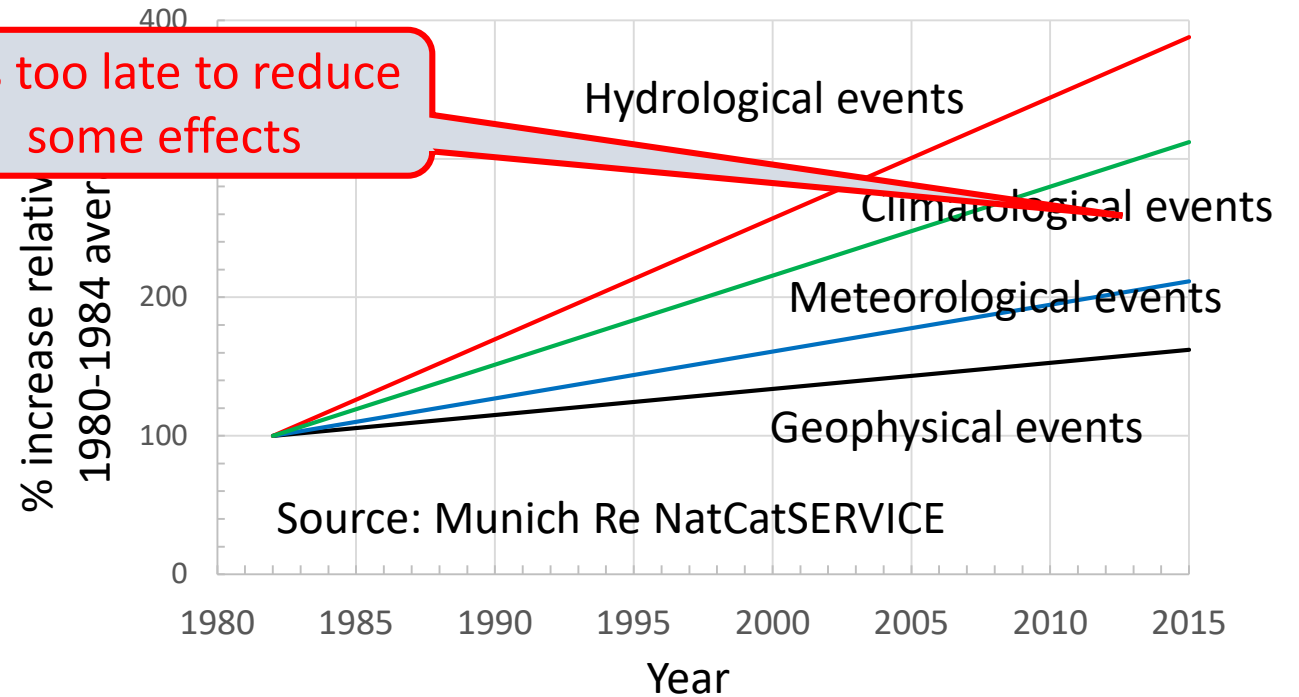
EASAC policy report 22, Trends in extreme weather events in Europe: implications for national and European Union adaptation strategies, November 2013, ISBN: 978-3-8047-3239-1

This report can be found at

https://www.easac.eu/fileadmin/PDF_s/reports_statements/Easac_Report_Extreme_Weather_Events.pdf

<https://www.munichre.com/en/reinsurance/business/non-life/natcatservice/index.html>

It is too late to reduce some effects



Coral Reefs - tipping points [Lontzek].

At 2 degrees Coral reefs are gone. The sixth extinction event

- NASA: “At 1.5 degrees, the study found that tropical coral reefs stand a chance of adapting and reversing a portion of their die-off in the last half of the century. But at 2 degrees, the chance of recovery vanishes. Tropical corals are virtually wiped out by the year 2100.” <https://climate.nasa.gov/news/2458/why-a-half-degree-temperature-rise-is-a-big-deal/>
- Reefs support about 26% of ocean marine biodiversity and if they experience significant mortality that would signal we have caused the sixth major mass extinction event. No mass bleaching events were ever observed before 1983. Bleaching events have become routine when the temperature anomaly above the 1880-1910 average passed a 0.6° C threshold. The 0.9° C threshold crossed in 1998 leads to global bleaching and mortality events in 1998, then in 2010 and again in 2014 (first multi-year event, on-going).
- Senator Sheldon Whitehouse in May, 2018 made an accurate presentation in the Senate, citing the latest science.
- Whitehouse cites Terry Hughes and colleagues, who conclude: “Tropical reef systems are transitioning to a new era in which the interval between recurrent bouts of coral bleaching is too short for a full recovery of mature assemblages. We analyzed bleaching records at 100 globally distributed reef locations from 1980 to 2016. The median return time between pairs of severe bleaching events has diminished steadily since 1980 and is now only 6 years.”

Thomas S. Lontzek, Yongyang Cai, Kenneth L. Judd and Timothy M. Lenton, Stochastic integrated assessment of climate tipping points indicates the need for strict climate policy, Nature Climate Change, 23 March 2015, DOI: 10.1038/NCLIMATE2570

[Whitehouse] <https://www.youtube.com/watch?v=r1EizctbyPs>

Hughes et al., Spatial and temporal patterns of mass bleaching of corals in the Anthropocene, Science 359, 80–83 (2018) 5 January 2018.

We are already over committed to fossil fuels

“These are the sites where the necessary wells have been (or are being) drilled, the pits dug, and the pipelines, processing facilities, railways, and export terminals constructed.”

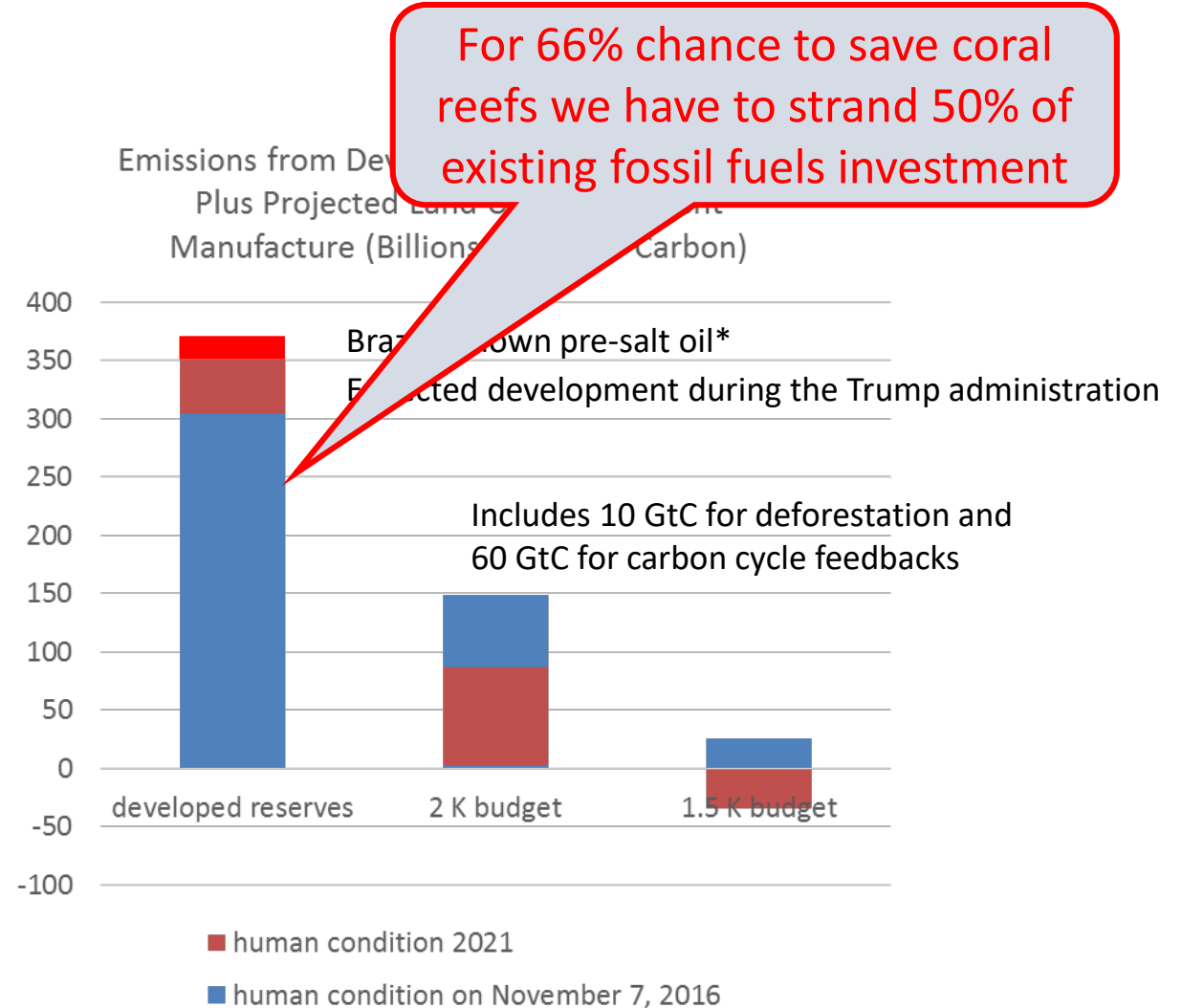
We have overdeveloped fossil fuel reserves [priceofoil] and about 30% of total reserves of fossil fuels are already in operation or under construction as of end 2015.

In order to have any chance of staying under two degrees we will have to strand as much as 50% of developed assets, i.e., investors will have to lose money.

[priceofoil]

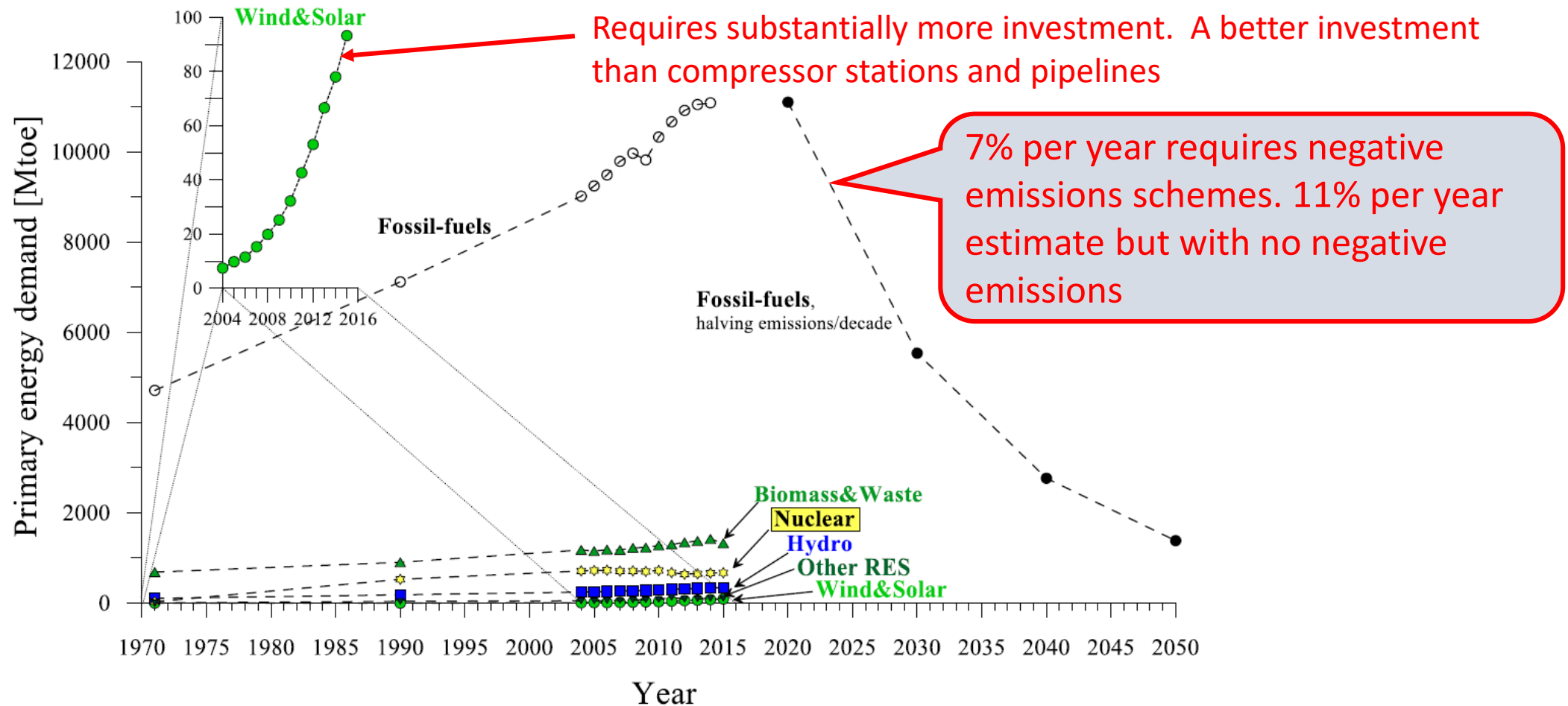
http://priceofoil.org/content/uploads/2016/09/OCI_the_skys_limit_2016_FINAL_2.pdf

Source: Rystad Energy, International Energy Agency, World Energy Council, IPCC



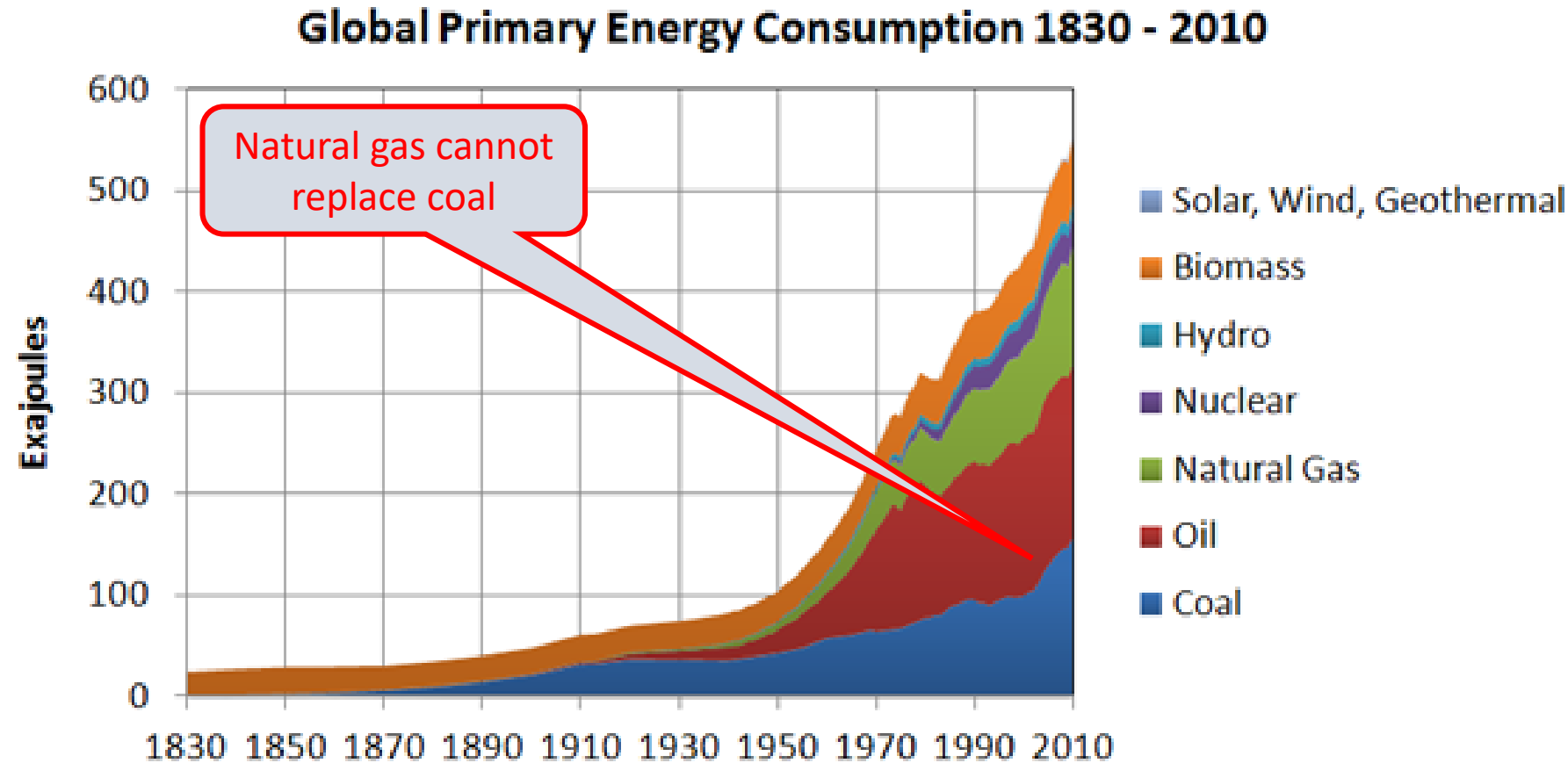
[*https://climatenewsnetwork.net/23561-2/](https://climatenewsnetwork.net/23561-2/)

Wind and solar are fastest growing by percent but fossil fuels are growing faster absolutely.



Filip Johnsson, Jan Kjärstad & Johan Rootzén (2018): The threat to climate change mitigation posed by the abundance of fossil fuels, Climate Policy: <https://doi.org/10.1080/14693062.2018.1483885>

The human macro-economic organism has never replaced one energy source with another. Natural gas does not replace coal. Since 2000 coal has been the fastest growing energy source



Likely Economic Collapse why any new pipeline will make that problem worse.

Economists Green and Denniss: we cannot build out any new fossil fuels infrastructure, i.e., pipelines, fracked natural gas facilities, etc. because we are already over invested and much of existing infrastructure will have to be stranded. They recommend restricting all new fossil fuels investment. A good summary article by Dave Roberts is references below.

Seto et al. Call this carbon lock-in. Once the investment is made it is difficult not to use it.

To avoid carbon lock-in requires moratorium on all new fossil fuels investment

Commentary: Dave Roberts, <https://www.vox.com/energy-and-environment/2018/4/3/17187606/fossil-fuel-supply>

Fergus Green & Richard Denniss, Cutting with both arms of the scissors: the economic and political case for restrictive supply-side climate policies, *Climate Change*, <https://doi.org/10.1007/s10584-018-2162-x> 2018.

Karen C. Seto, Steven J. Davis, Ronald B. Mitchell, Eleanor C. Stokes, Gregory Unruh, and Diana Urge-Vorsatz, Carbon Lock-In: Types, Causes, and Policy Implications, *Annu. Rev. Environ. Resour.* 2016. 41:425–52, September 2, 2016 doi: 10.1146/annurev-environ-110615-085934

Likely Economic Collapse why any new pipeline will make that problem worse.

Mercure et al. in Nature Climate Change: existing investment in assets that have to be stranded will cause another economic collapse, reason for a moratorium on all new fossil fuels investment.

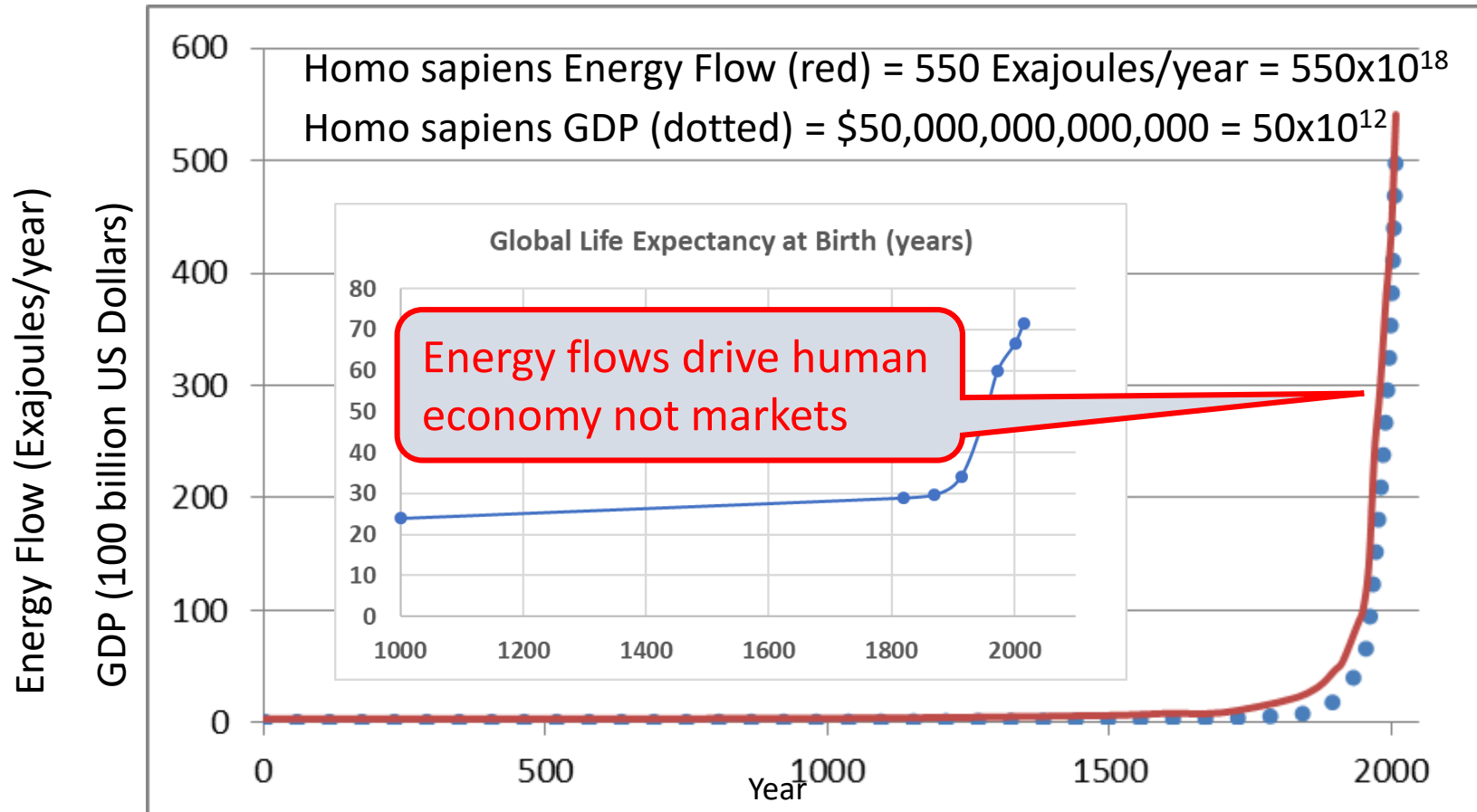
To avoid economic collapse requires moratorium on all new fossil fuels investment

Grubler et al. Show that we can keep warming under 2° C technically, but requires changing ourselves.

J.-F. Mercure, H. Pollitt, J. E. Viñuales, N. R. Edwards, P. B. Holden, U. Chewpreecha, P. Salas, I. Sognnaes, A. Lam and F. Knobloch, Macroeconomic impact of stranded fossil fuel assets, NCC, <https://doi.org/10.1038/s41558-018-0182-1> 2018.

Arnulf Grubler, Charlie Wilson, Nuno Bento, Benigna Boza-Kiss, Volker Krey, David L. McCollum, Narasimha D. Rao, Keywan Riahi, Joeri Rogelj, Simon De Stercke, Jonathan Cullen, Stefan Frank, Oliver Fricko, Fei Guo, Matt Gidden, Petr Havlík, Daniel Huppmann, Gregor Kiesewetter, Peter Rafaj, Wolfgang Schoepp and Hugo Valin, A low energy demand scenario for meeting the 1.5 °C target and sustainable development goals without negative emission technologies, Nature Energy, Vol. 3, June 2018, 515–527

World Energy Flow Hockey Stick (energy drives the human economy not markets or finance)



Sources: Angus Maddison, Growth and Interaction in the World Economy The Roots of Modernity, American Enterprise Institute, 2004.
http://www.ggdc.net/maddison/other_books/Growth_and_Interaction_in_the_World_Economy.pdf

James C. Riley, Estimates of Regional and Global Life Expectancy, 1800–2001. Issue Population and Development Review. Population and Development Review. Volume 31, Issue 3, pages 537–543, September 2005.
<https://ourworldindata.org/life-expectancy/>

http://www.who.int/gho/mortality_burden_disease/life_tables/situation_trends/en/

The human system grows through a self-perpetuating feedback loop in which the consumption rate of primary energy resources stays tied to the historical accumulation of global economic production through a time-independent factor of $9.7 \pm 0.3 \text{ mW}$ per inflation-adjusted 1990 US dollar.

Source: Timothy J. Garrett, “Are there basic physical constraints on future anthropogenic emissions of carbon dioxide?, Climatic Change (2011) 104:437–455 DOI 10.1007/s10584-009-9717-9

Between a rock and a hard place

- To address climate change we need to strand existing fossil fuels investment. This can lead to a credit crisis worse than 2008 unless done properly. That is the rock.
- If we do not strand existing fossil fuels investment, with high probability we will collapse Western civilization. That is the hard place.
- We can survive a credit crisis. We cannot survive civilization collapse. If managed properly a credit crisis can be a blessing rather than a curse. With adequate safety nets we can ensure nobody gets hurt and if extreme wealth and power inequality is reduced, society will be much better off. This addresses both of the problems Pope Francis identified in his encyclical.

Solution summary

- International regulation, standards and a moratorium on all new fossil fuels infrastructure investment. Supply Side regulation.
- We have to change social norms, our behaviors, our values and our economy. Yes, mine too.
- Investment in new pipelines is not simply a very bad investment in terms of human survivability but it represents a lost opportunity to invest that money in demand side solutions(specifically conservation) such as home energy audits and mass transportation and in supply side solutions such as solar, wind and geothermal.

Background

My expertise

Tony Noerpel, Lovettsville, Virginia

<https://blueridgeleader.com/category/columns/sustainable-planet/>



INFRARED

10 30μm

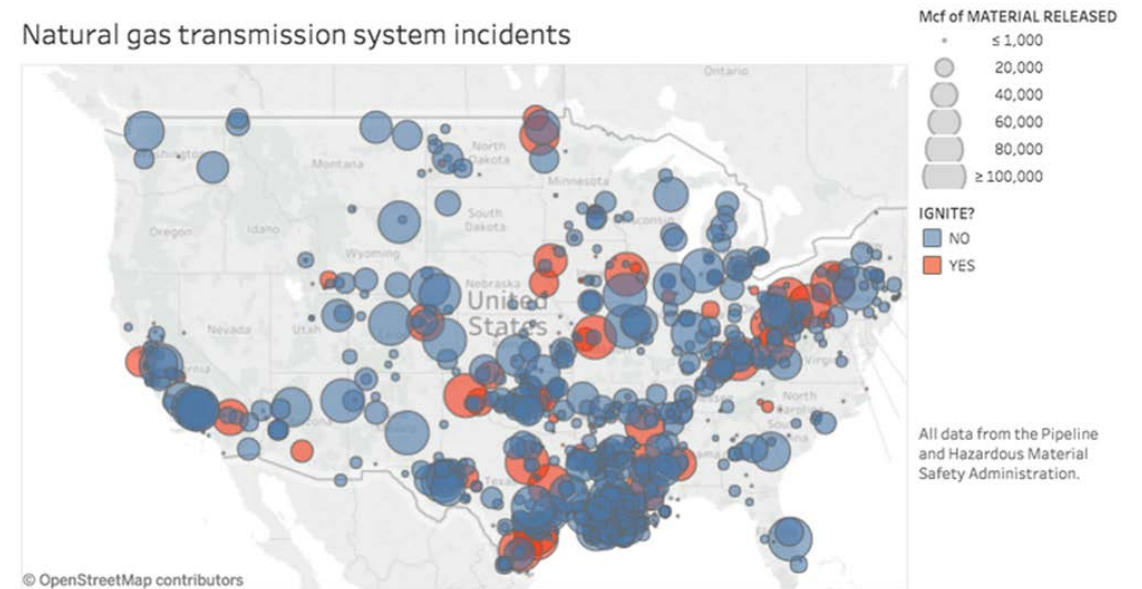
100 3μm

Y →

Methane leak documentation

Methane Leaks documentation

- Kathryn McKain, Adrian Down, Steve M. Raciti, John Budney, Lucy R. Hutyra, Cody Floerchinger, Scott C. Herndon, Thomas Nehrkorn, Mark S. Zahniser, Robert B. Jackson, Nathan Phillips, and Steven C. Wofsy, Methane emissions from natural gas infrastructure and use in the urban region of Boston, Massachusetts, PNAS January 23, 2015. 201416261; published ahead of print January 23, 2015.
<https://doi.org/10.1073/pnas.1416261112>
- <https://www.edf.org/climate/methanemaps>
- https://www.epa.gov/sites/production/files/2016-04/documents/methane_leaks.pdf
- [Jonathan Thompson ANALYSIS Nov. 29, 2017](#)
- <https://www.hcn.org/issues/49.22/infographic-a-map-of-leaking-natural-gas-pipelines-across-the-nation>
- The massive 2016 Aliso Canyon methane leak is not included because natural gas storage sites are not under the PHMSA's jurisdiction.
- Also:
http://hejc.environment.harvard.edu/files/hejc/files/hejc_natural_gas_leaks.pdf
- <https://fivethirtyeight.com/features/methane-is-leaking-all-over-the-place/>



Since 2010, ruptures, leaks and breaches in the U.S. natural gas transmission system -- or long-distance pipelines -- have resulted in the loss of more than 17 billion cubic feet of natural gas. That's enough to heat more than 200,000 homes for a year and results in methane emissions equivalent to the carbon dioxide put out by driving 1.5 million cars for a year.



The ruins of houses destroyed by a wild fire in California. Photograph: David McNew/Getty Images

Civilization at risk

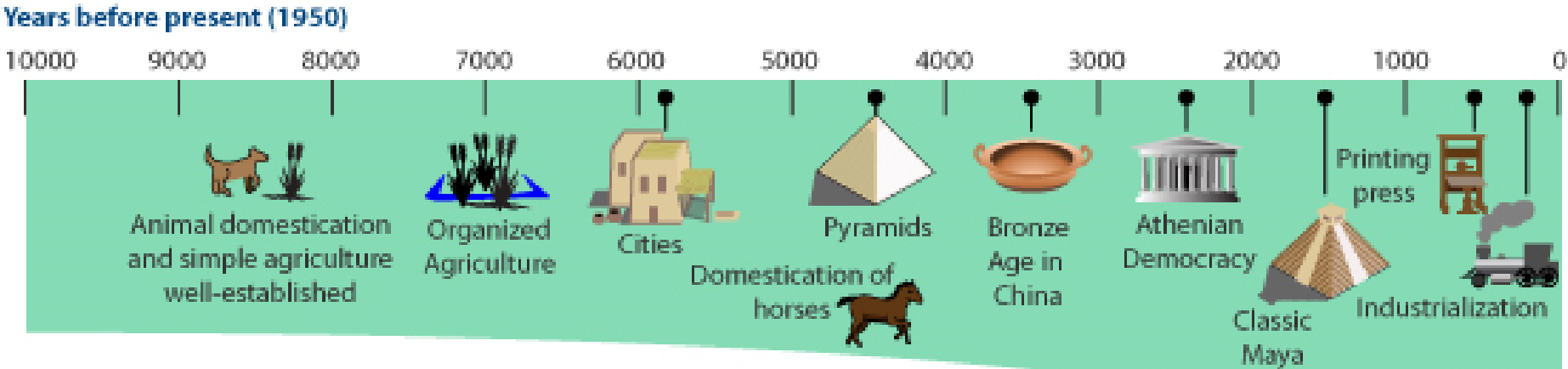
Please refer to my articles describing a two degree world. In particular the third article on agriculture. <https://blueridgeleader.com/52779-2/>

Note: some good books on the topic: James C. Scott “Against the Grain”, Walter Scheidel “The Great Leveler”, John L. Brooke “Climate Change and the Course of Global History”, Harvey Weiss, “Megadroughts and Collapse, from early agriculture to Angkor”

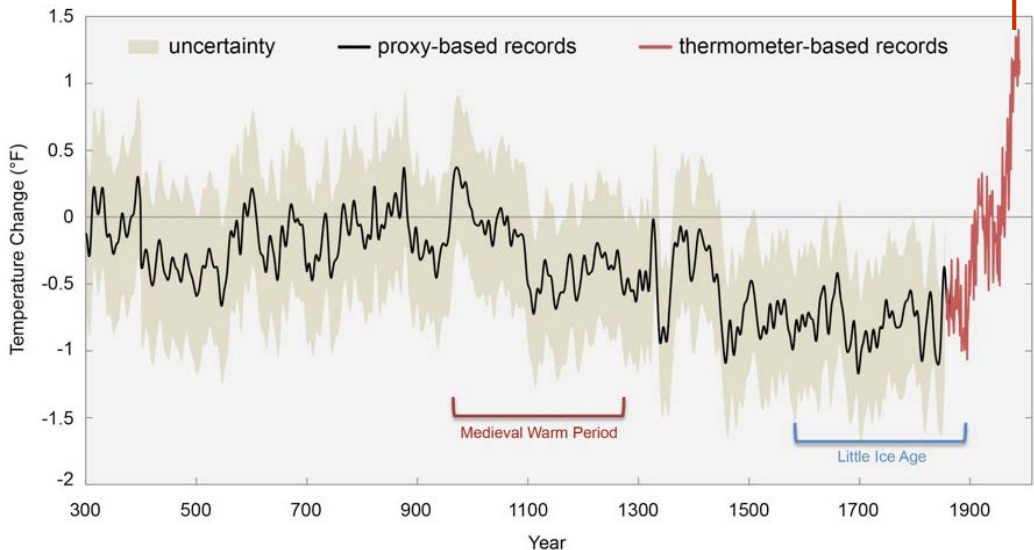
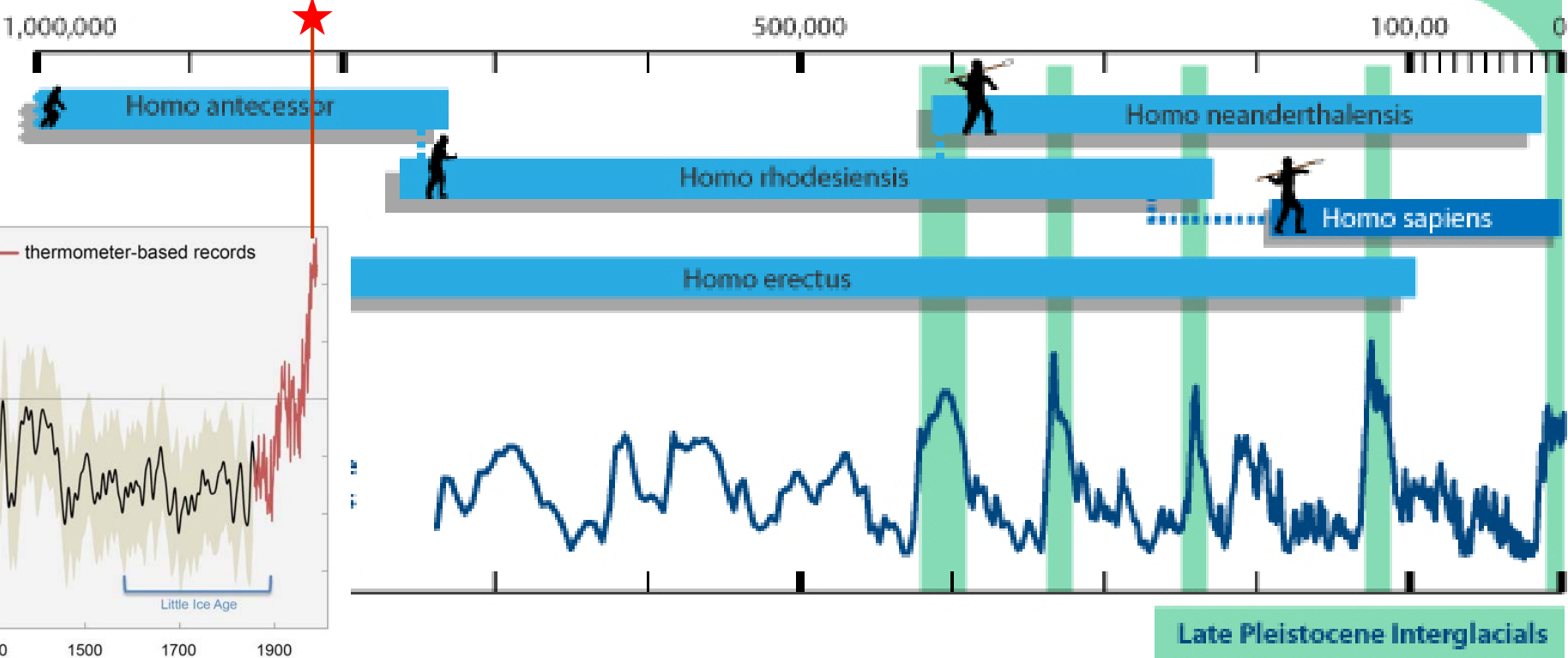
“Humans are likely to create a catastrophe, and possibly an associated disaster, that vastly exceeds our own ability to recover from it. In the face of all our efforts, it will persist.” – Richard Guthrie

Richard Guthrie, The catastrophic nature of humans, Nature Geoscience, Vol 8, June 2015, www.nature.com/naturegeoscience

Global Climate, Human Evolution and Civilization



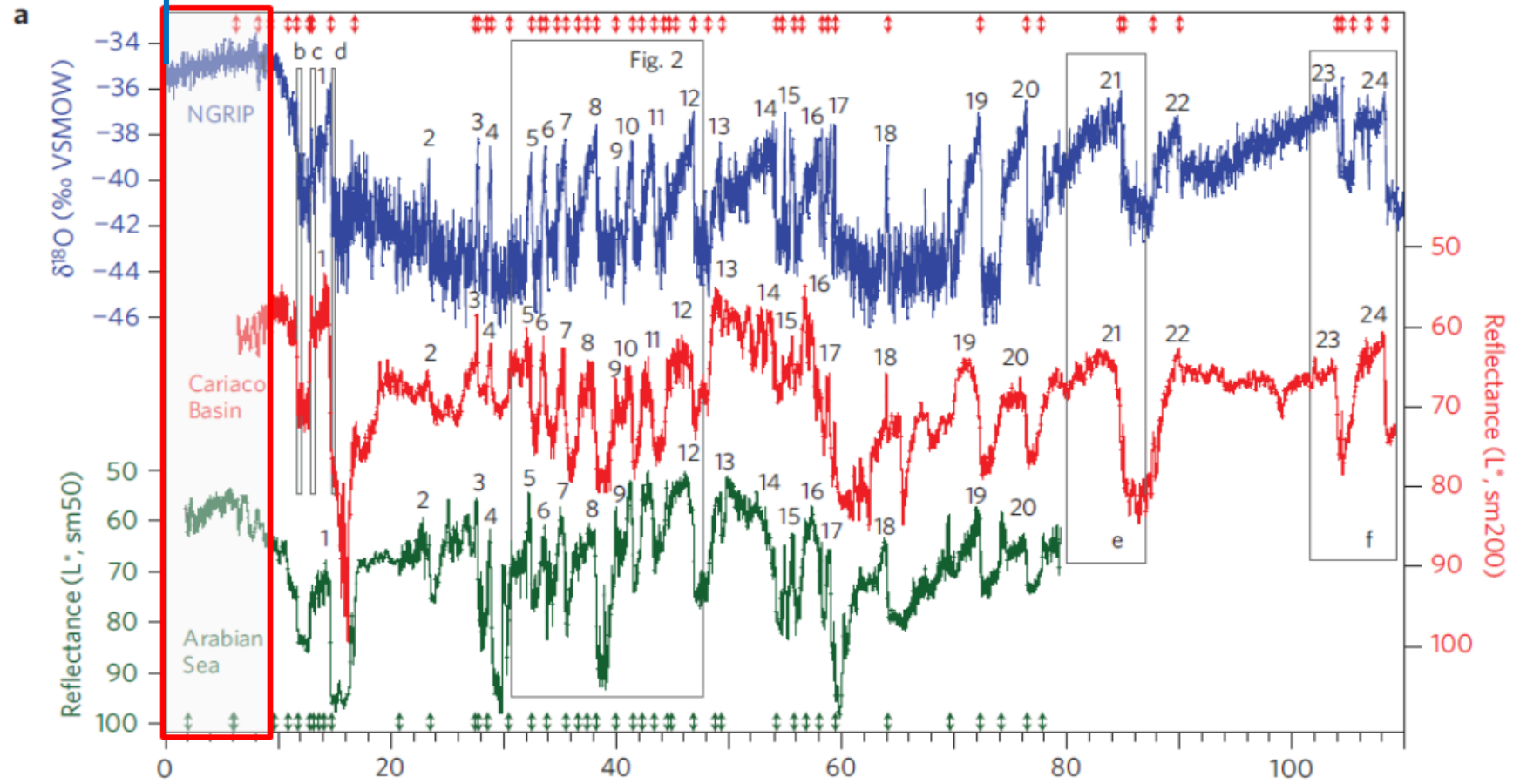
“The likely range of global temperature increase is 2.0–4.9 °C, with median 3.2 °C and a 5% (1%) chance that it will be less than 2 °C (1.5 °C).” Adrian E. Raftery, Alec Zimmer, Dargan M.W. Frierson, Richard Startz and Peiran Liu, Less than 2 C warming by 2100 unlikely, Nature Climate Change, 31 July 2017, DOI: 10.1038/NCLIMATE3352



climate system is non-linear

Business-as-usual forecast up to 2100

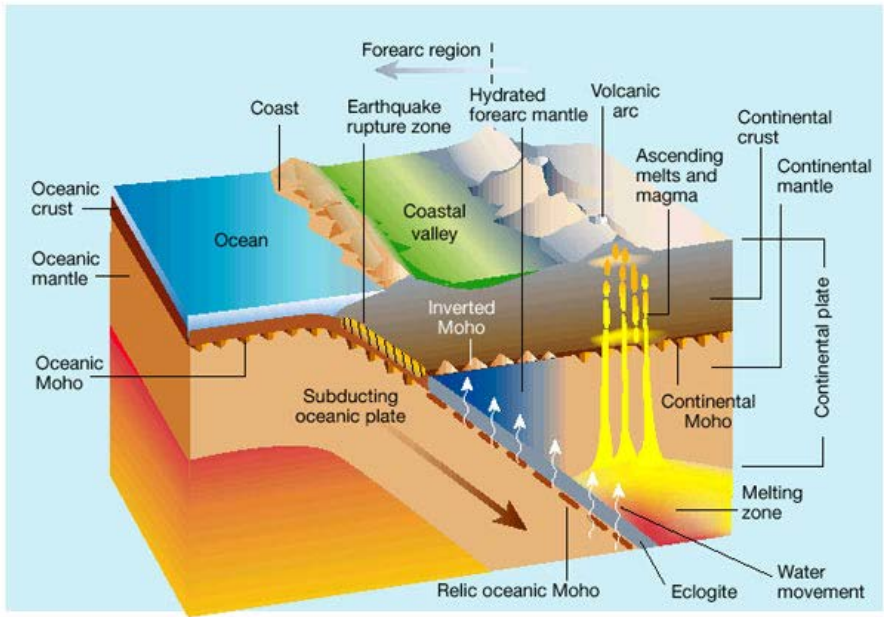
Human civilization (Evolved during a 10,000 year window of extremely stable climate)



Kilo-years before present

Historical Context and Extinction Risk

Why human caused climate change is uniquely an existential risk to humanity.



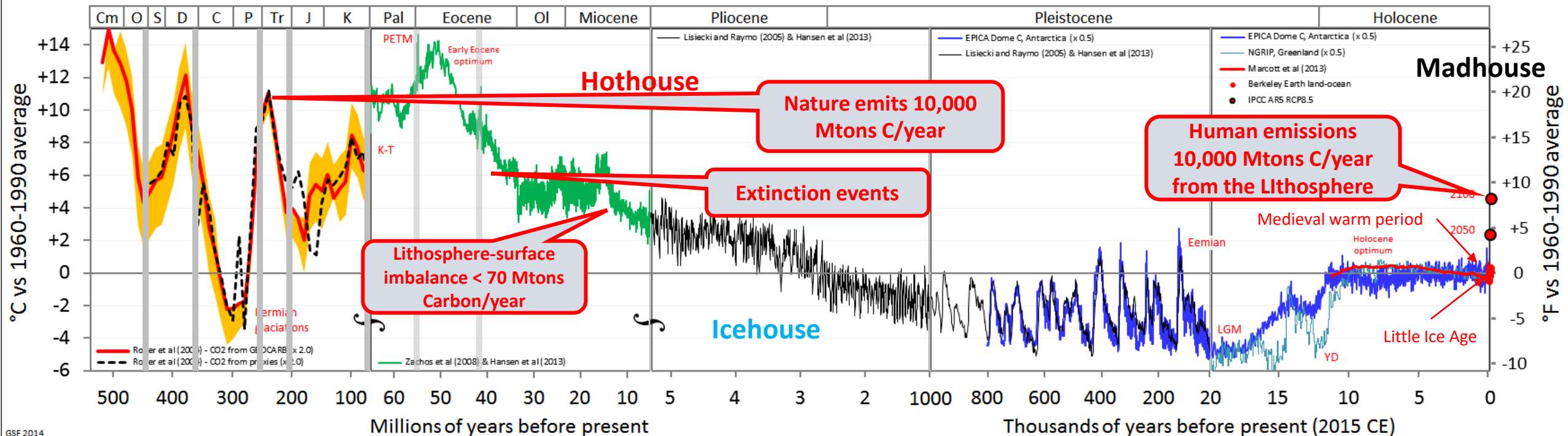
McKenzie et al, Continental arc volcanism as the principle driver of icehouse-greenhouse variability, Science, vol 352, issue 6284, 22 April 2016.

The climate system is stable in terms of supporting liquid water and life but is not stable within the range of any given organism.

That is why there have been extinction events.

<http://www.nature.com/nature/journal/v417/n6888/images/417497a-f1.2.jpg>

Temperature of Planet Earth



Extinction events

Analogue for current crisis
95% of plants and animals go
extinct

Genus Homo, species sapiens

[LIP] <http://www.largeigneousprovinces.org/>

Why didn't these
volcanic events cause
major extinctions

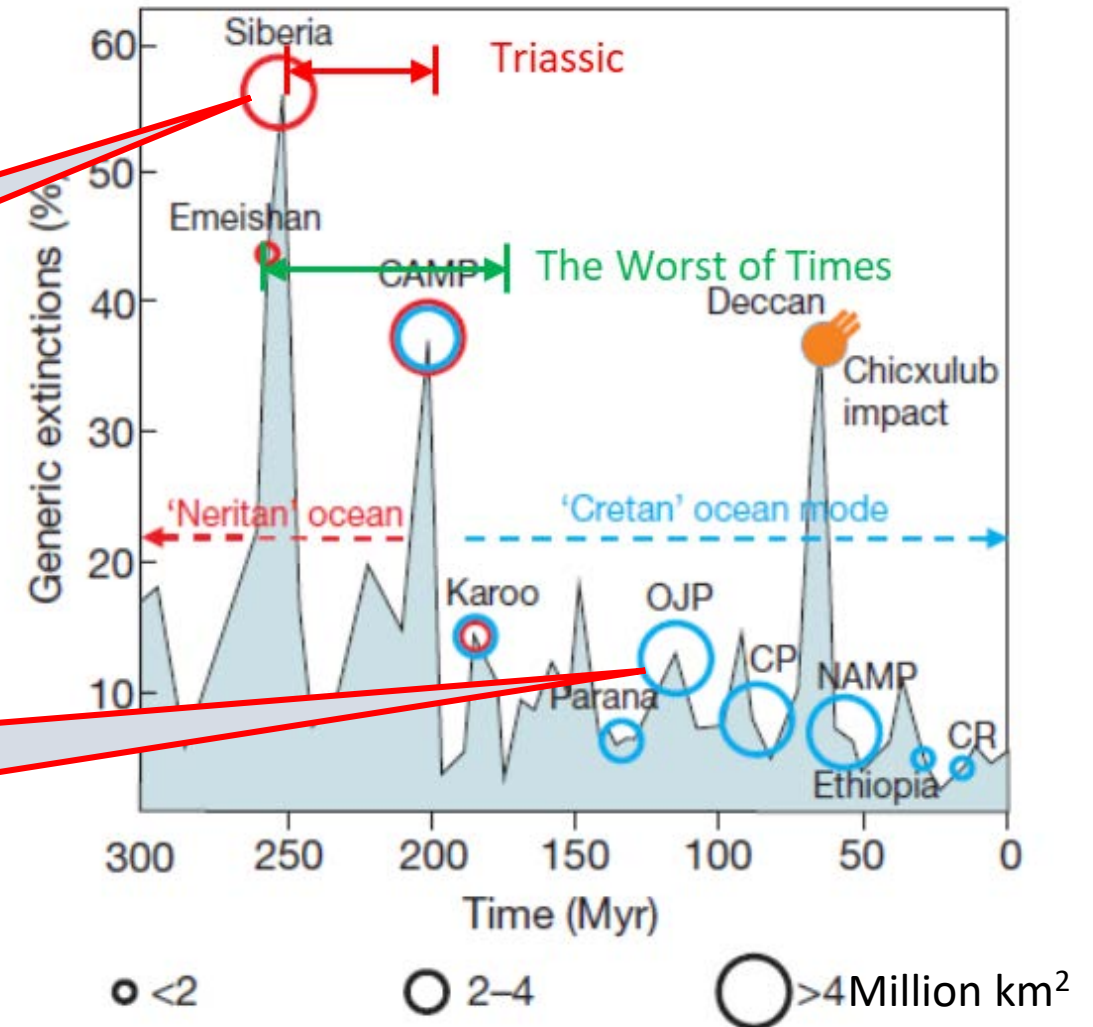


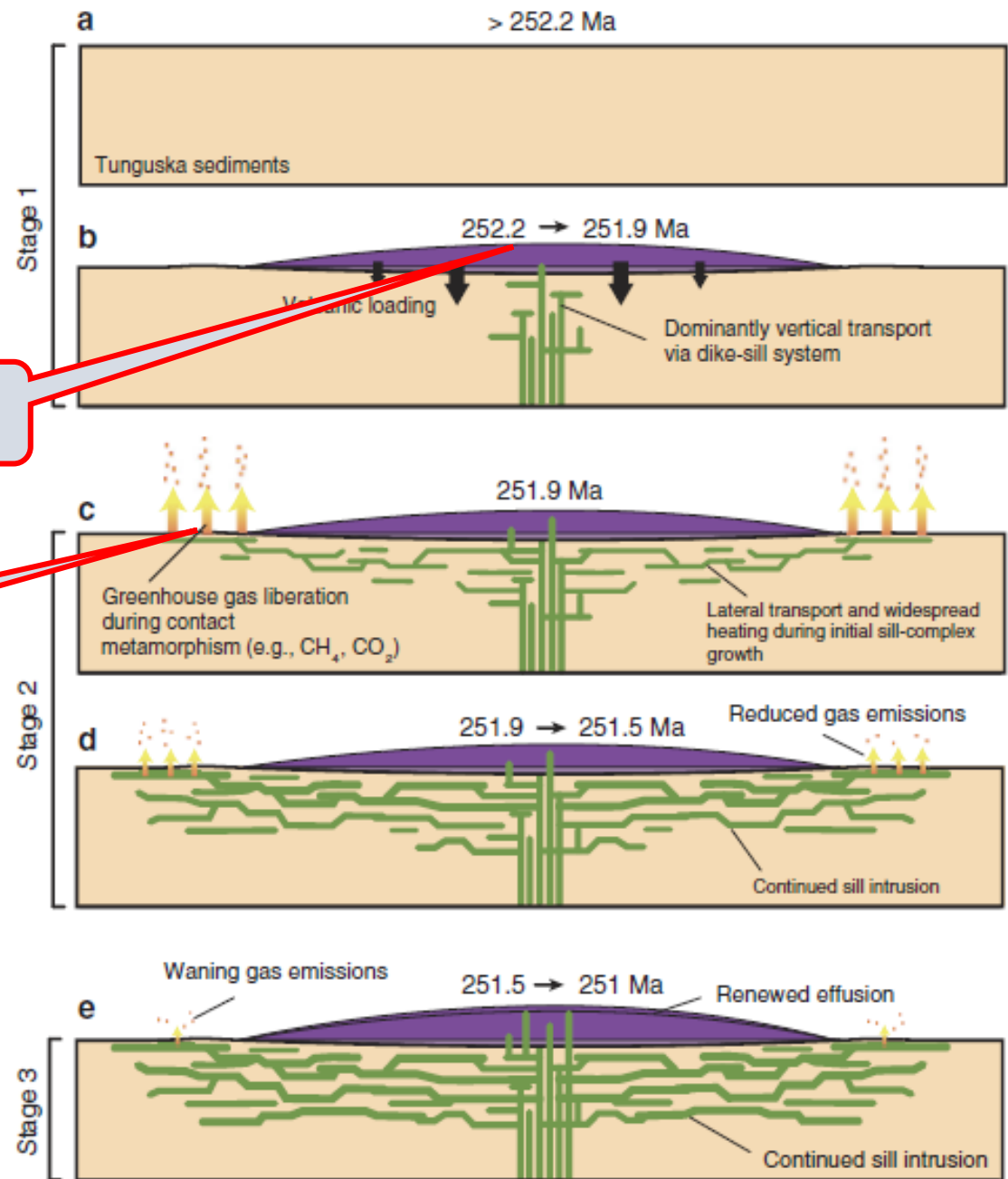
Figure 1. Plot of mass extinction intensity (light blue field) with major LIPs (circles) against geological time
Stephan V. Sobolev, Alexander V. Sobolev, Dmitry V. Kuzmin, Nadezhda A. Krivolutsкая, Alexey G. Petrunin, Nicholas T. Arndt, Viktor A. Radko & Yuri R. Vasiliev, Linking mantle plumes, large igneous provinces and environmental catastrophes, Nature, Vol. 477, 15 September, 2011.

Kill mechanism carbon emissions from carbon rich sediment same source as human emissions and at the same rate

< 70 MtC/year

About 10,000 MtC/year

[Burgess] S.D. Burgess, J.D. Muirhead & S.A. Bowring, Initial pulse of Siberian Traps sills as the trigger of the end-Permian mass extinction, Nature Comm. 2017, DOI: 10.1038/s41467-017-00083-9



End Permian Extinction dead zone – 50% of Earth surface

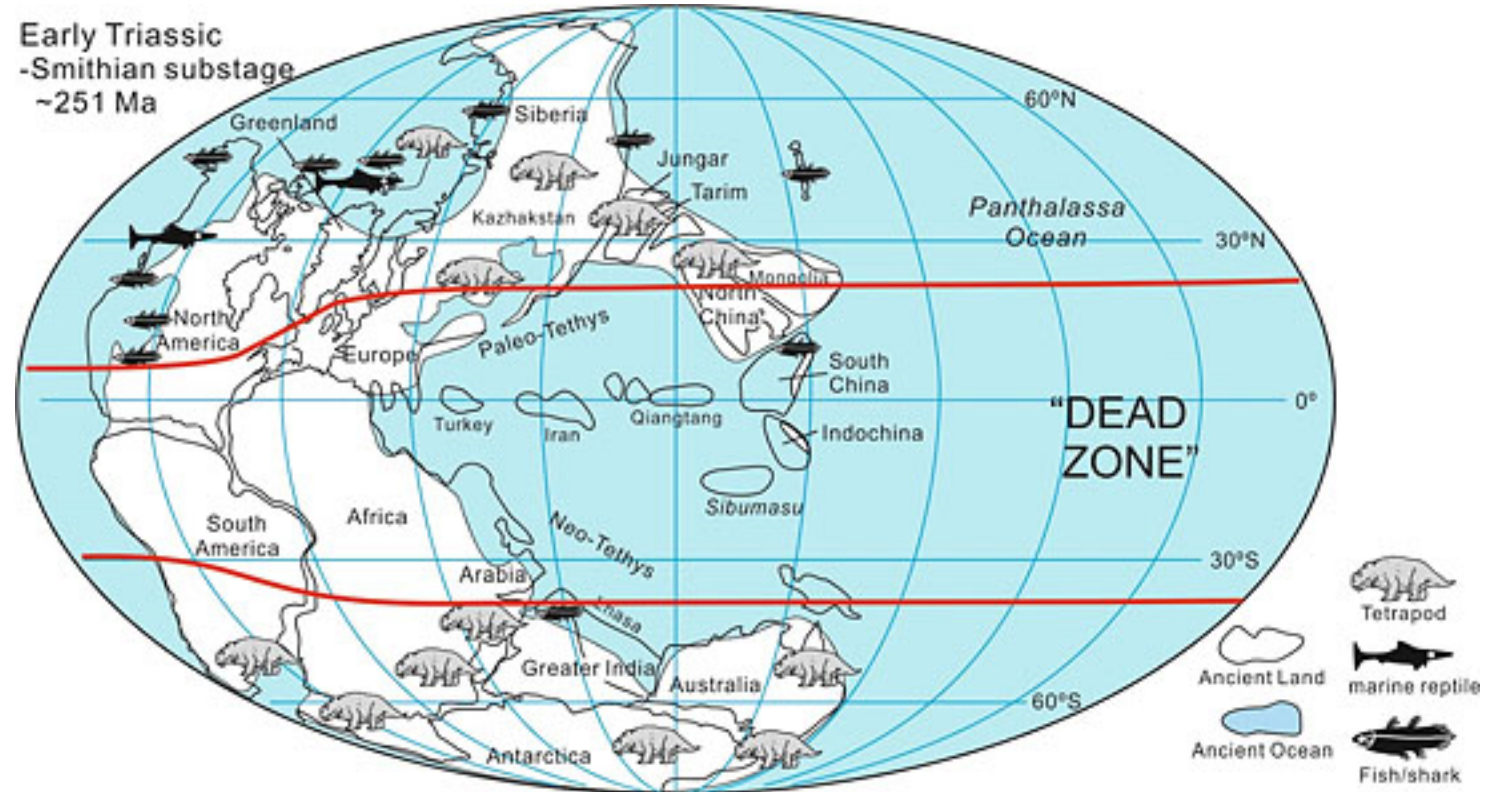
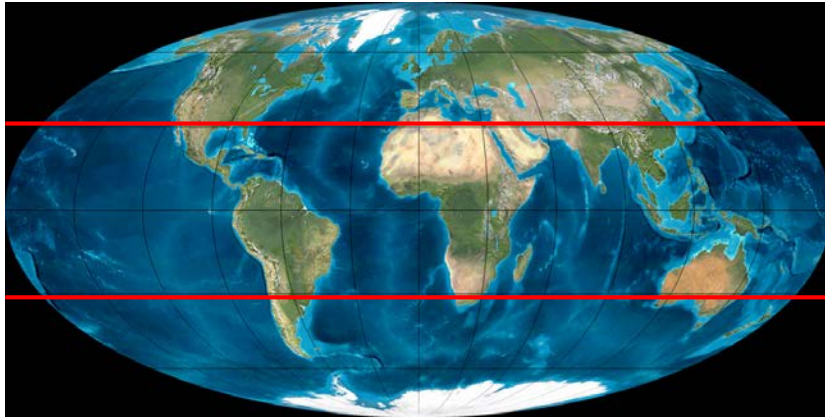


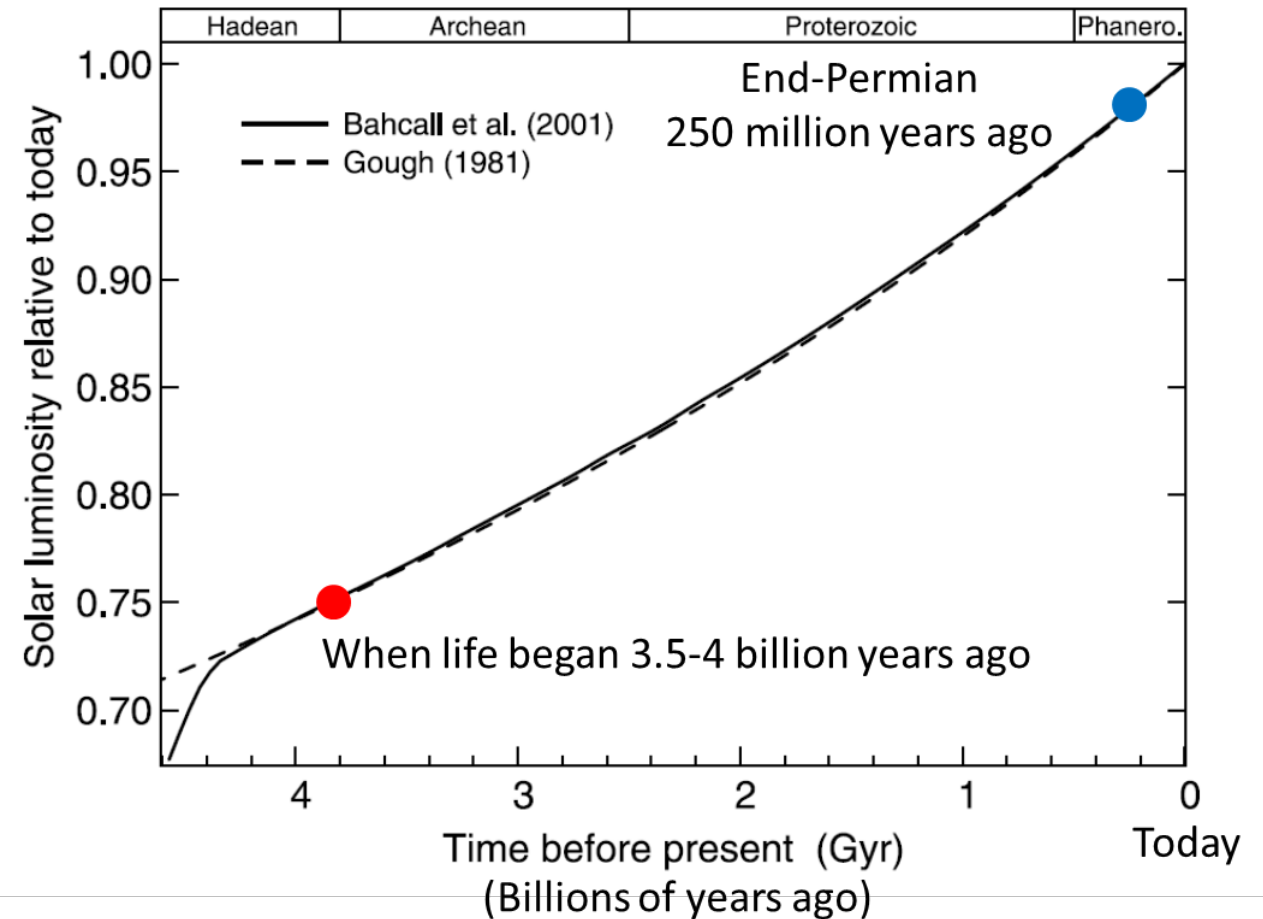
Figure 2 Dead zone in the tropics (Source: University of Leeds). <https://www.asianscientist.com/2012/10/in-the-lab/earth-hot-mass-extinction-250-million-years/> Yadong Sun, Michael M. Joachimski, Paul B. Wignall, Chunbo Yan, Yanlong Chen, Haishui Jiang, Lina Wang, Xulong Lai, Lethally Hot Temperatures During the Early Triassic Greenhouse, Science 19 Oct 2012: Vol. 338, Issue 6105, pp. 366-370 DOI: 10.1126/science.1224126 Alexandra Witze, Ancient volcanoes exposed, Geologists unearth signs of huge planet-altering events stretching back 3 billion years Nature, 16 March 2017, Vol. 543.

Faint young sun paradox – climate is more sensitive today to carbon emissions

Time period	Solar intensity Relative to today	Atmospheric Carbon dioxide (ppmV)	
		Modern climate	+ 7-10 °C
End Permian	98%	1200	5000-10000
Today	100%	300	1200-2500

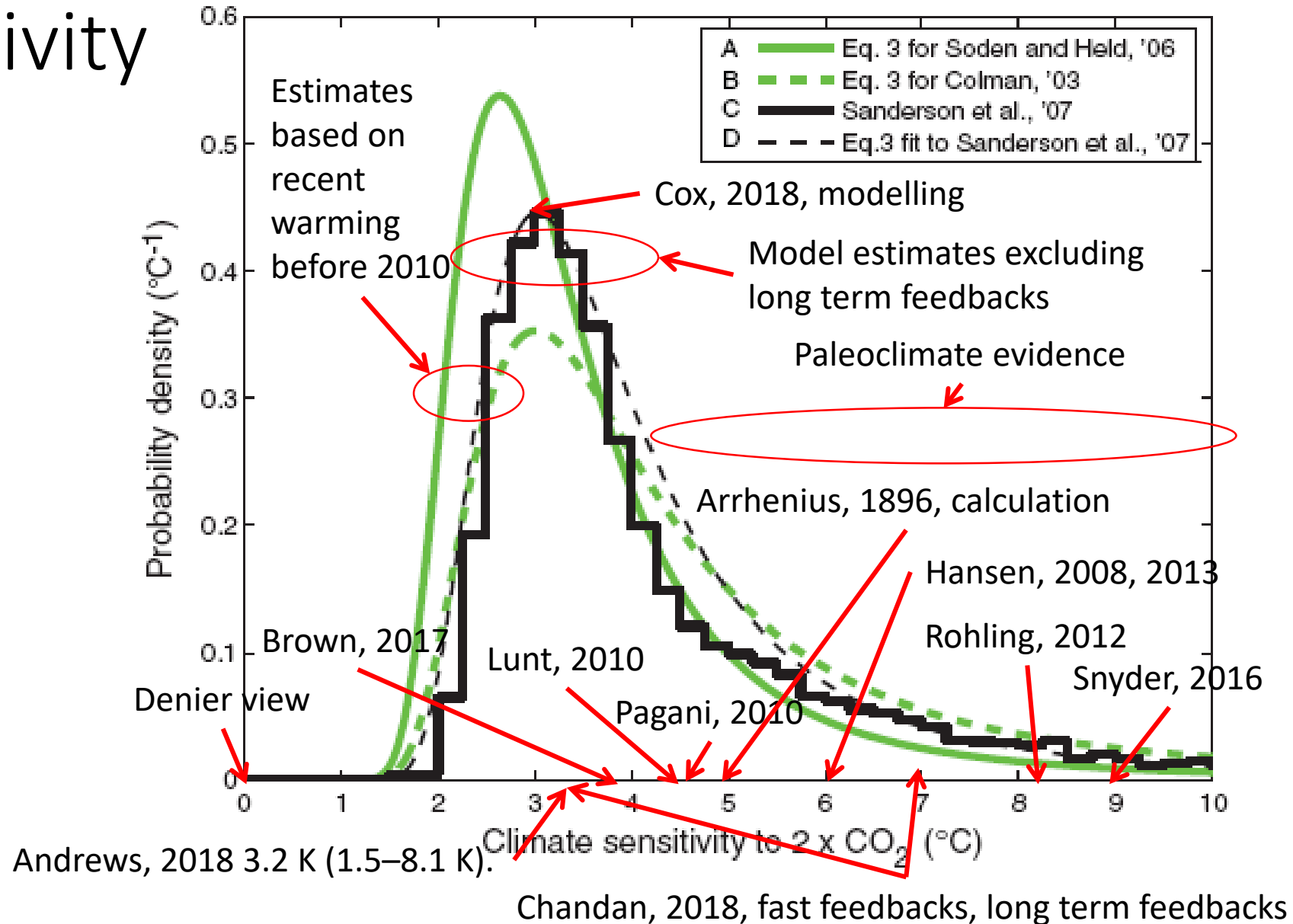
Note: assumes ECS = 3K

Evolution of solar luminosity over the four geologic eons for the standard solar model described [Bahcall] (solid line) and according to the approximation formula [Gough] (dashed line).



[Feulner] Georg Feulner, The faint young Sun problem, Rev. Geophys., 50, RG2006, doi:10.1029/2011RG000375, 25 May 2012. [Foster] Gavin L. Foster, Dana L. Royer & Daniel J. Lunt, Future climate forcing potentially without precedent in the last 420 million years, Nature Communications, DOI: 10.1038/ncomms14845 www.nature.com/naturecommunications 4 April, 2017 [Gough] Gough, D. O. Solar interior structure and luminosity variations. Solar Phys. 74, 21–34 (1981).

Equilibrium Climate Sensitivity



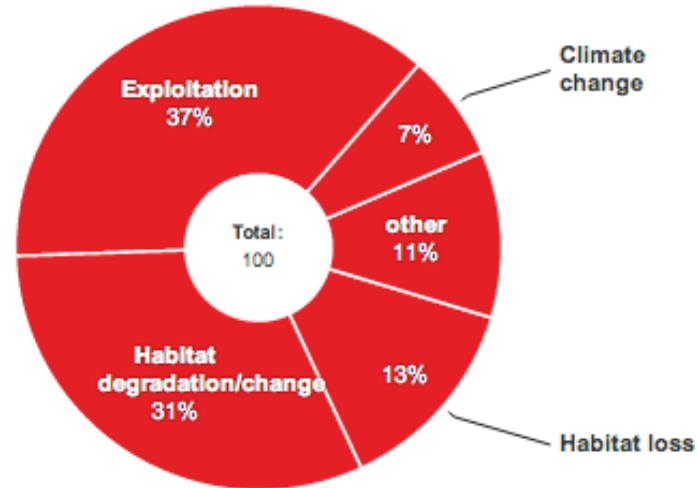
Climate change only one anthropogenic stressor on biosphere

Asch, R.G., W.W.L. Cheung and G. Reygondeau. 2017. Future marine ecosystem drivers, biodiversity, and fisheries maximum catch potential in Pacific Island Nations under climate change. Marine Policy doi:10.1016/j.marpol.2017.08.015

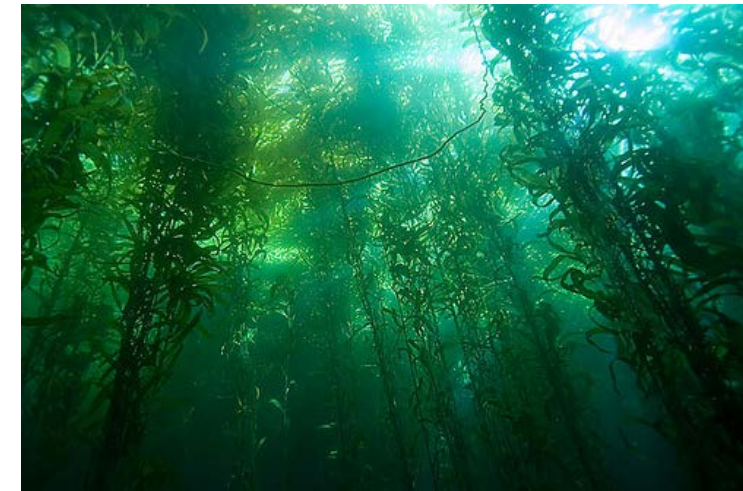
<http://e360.yale.edu/features/as-oceans-warm-the-worlds-giant-kelp-forests-begin-to-disappear>

Causes of wildlife declines globally

WWF's 'Living Planet Index' categorises the causes of wildlife declines based on analysis of 3,430 species' populations



SOURCE: WWF



theguardian

Virginie Raybaud, Gregory Beaugrand, Eric Goberville, Gaspard Delebecq, Christophe Destombe, Myriam Valero, Dominique Davoult, Pascal Morin, Francois Gevaert, Decline in Kelp in West Europe and Climate, PLOS ONE, www.plosone.org 1 June 2013, Volume 8, Issue 6, e66044



Sixth extinction event is already underway

Table 1. Summary of estimated total biomass for abundant taxonomic groups		
Taxon	Biomass (GtC)	percentage
Plants	450	82%
Bacteria	70	13%
Fungi	12	2%
Archaea	7	1%
Protists	4	0.7%
Animals	2	0.4%
Arthropods, terrestrial	0.2	0.04%
Arthropods, marine	1	0.2%
Chordates, fish	0.7	0.1%
Chordates, livestock	0.1	0.02%
Chordates, humans	0.06	0.01%
Chordates, wild mammals	0.007	0.001%
Chordates, wild birds	0.002	0.0004%
Annelids	0.2	0.04%
Molluscs	0.2	0.04%
Cnidarians	0.1	0.02%
Nematodes	0.02	0.004%
Viruses	0.2	0.04%
Total	545	100%

Chordates, wild mammal population reduced by 87% by Homo sapiens during Holocene.

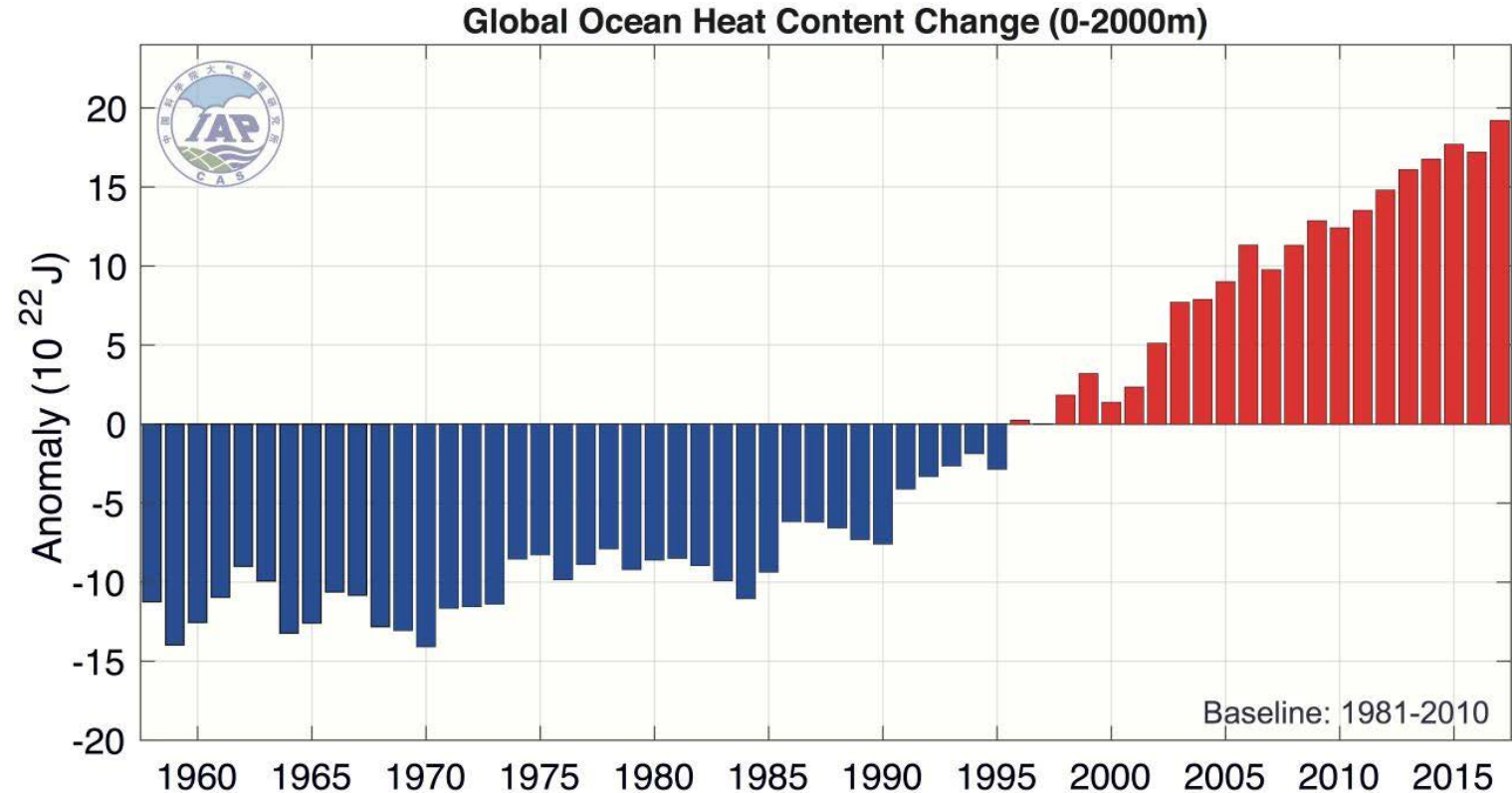
Current Climate Situation

Where we are now

2017 second warmest year on record highest global ocean heat content

Since 2009 Loudoun County Energy Strategy publication 2010, 2014, 2015 and 2016 were the warmest years on record and 2017 was the second warmest to 2016 and holds the record for highest ocean heart content.

Global coral reef mortality in 2010 and beginning in 2014 first ever observed multi-year coral bleaching event which is still ongoing.



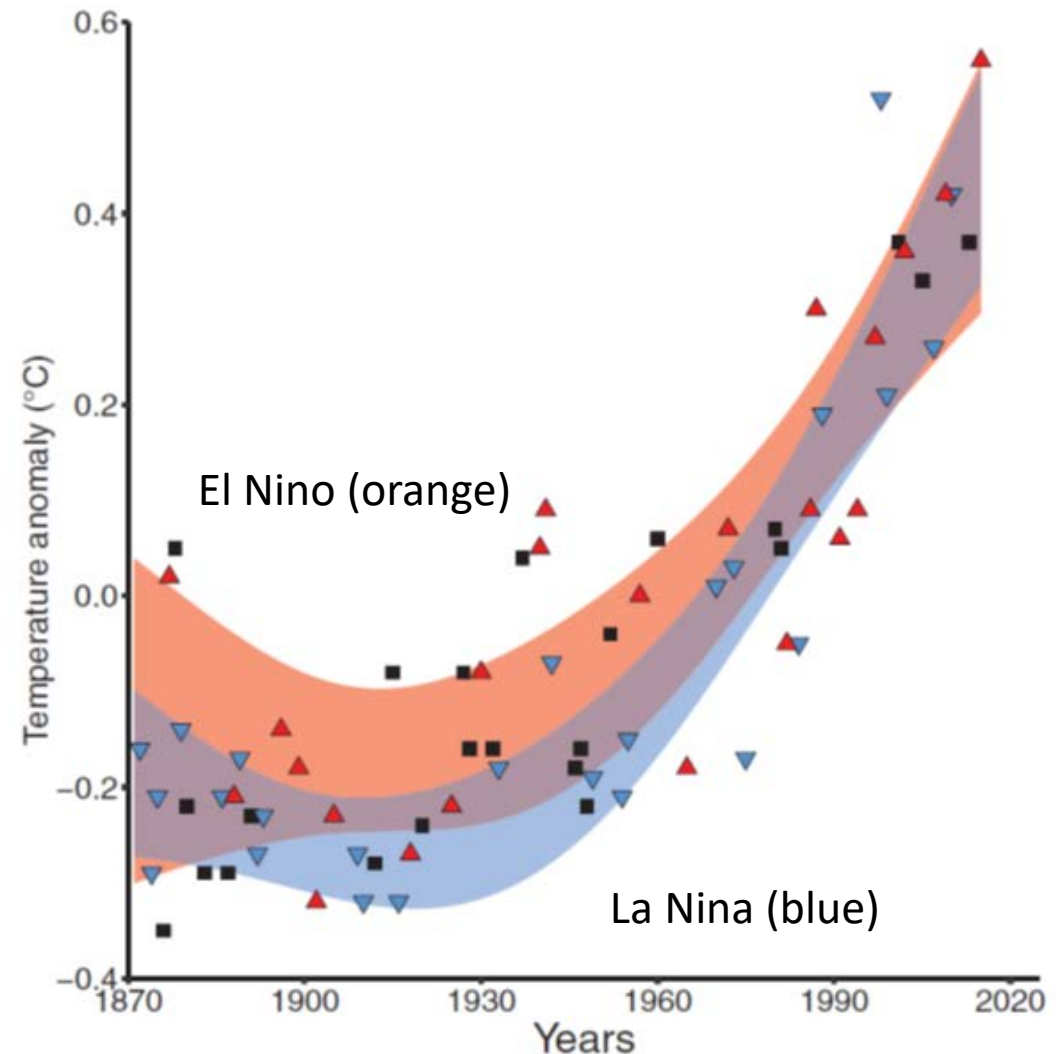
Lijing Cheng and Jiang Zhu
International Center for Climate and Environmental Science
Institute of Atmospheric Physics

<http://english.iap.cas.cn/>

“or even to stabilise the situation”

- El Nino Southern Oscillation Phases
- we may have already crossed a tipping point of sorts as both El Nino and La Nina conditions are now warm.
- “As global warming has progressed, tropical sea surface temperatures are warmer now during current La Niña conditions than they were during El Niño events three decades ago. Consequently, as we transition to the Anthropocene, coral bleaching is occurring more frequently in all El Niño–Southern Oscillation phases, increasing the likelihood of annual bleaching in the coming decades.” Hughes et al.

Hughes et al., Spatial and temporal patterns of mass bleaching of corals in the Anthropocene, Science 359, 80–83 (2018) 5 January 2018.

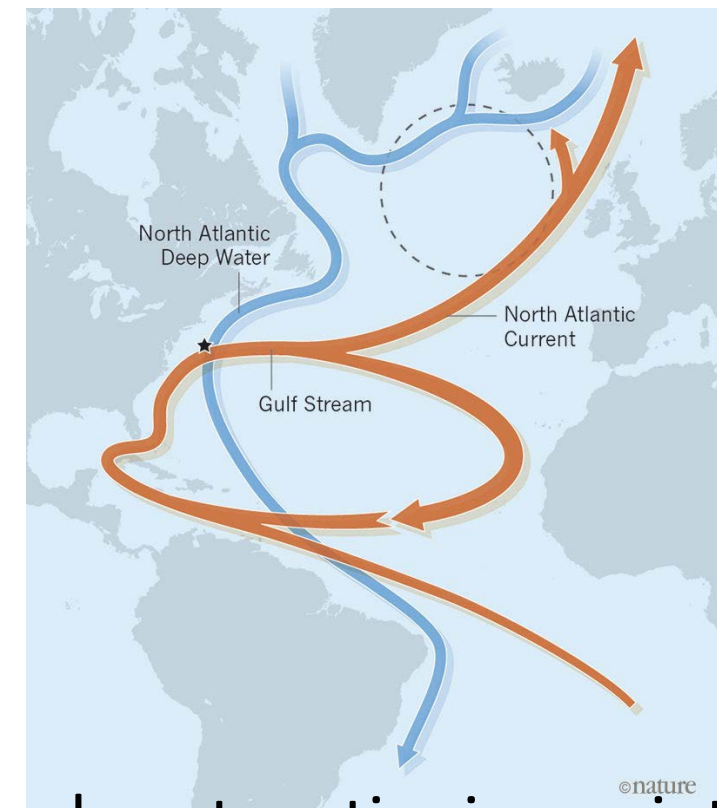


“or even to stabilise the situation”

- AMOC slowdown 15% could tip

L. Caesar, S. Rahmstorf, A. Robinson, G. Feulner¹ & V. Saba, Observed fingerprint of a weakening Atlantic Ocean overturning circulation, *Nature* 556, 191–196 (2018).

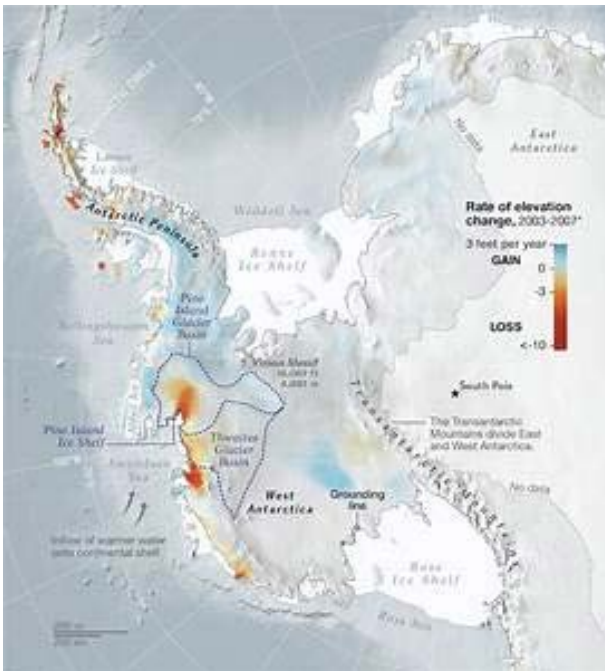
David J. R. Thornalley, et al., Anomalously weak Labrador Sea convection and Atlantic overturning during the past 150 years, *Nature* 556, 227–230 (2018).



- West Antarctic Glaciers close to a tipping point

Hannes Konrad, Andrew Shepherd, Lin Gilbert, Anna E. Hogg, Malcolm McMillan, Alan Muir and Thomas Slater, Net retreat of Antarctic glacier grounding lines, *Nature Geoscience*, Vol. 11, April 2018, 258–262.

David E. Shean, et al., GPS-derived estimates of surface mass balance and ocean-induced basal melt for Pine Island Glacier ice shelf, Antarctica, *Cryosphere*, EGU, 11, 2655–2674, 2017, <https://doi.org/10.5194/tc-11-2655-2017>



Whales – a success story

- International Whaling commission – used standards and regulation. Only time humans reduced the use of an energy source
- Helped that we were driving them into extinction
- And the whaling industry had limited wealth and political power
- And they are cute or an iconic species.
- Only things that work: standards and regulation
 - Opposed by Republicans and conservative Democrats

Note: Campbell comment. This should be strengthened as per discussion. Communications engineers and firms rely on standards and regulations published by ETSI, TIA, FCC, ITU, IEEE and other government and non-government organizations. The wall outlet is a standard as is the 120 Volts and 60 cycles per second. There are many health and safety standards. Anti-biotics need to be regulated to avoid ineffectiveness due to the evolution of superbugs.

<https://www.theguardian.com/society/2018/jan/23/number-of-new-antibiotics-has-fallen-sharply-since-2000>

To Do List

- Proactively reduce carbon emissions – supply side regulation
- More self-control, less self-importance
- Conservation – do with less
- Redefine Growth and replace GDP
- Moratorium on all new carbon energy reserves and infrastructure including natural gas. It does not replace coal.
- International, national and local standards and regulation of markets and behavior
- Alternative energy is necessary but not sufficient
- Efficiency is necessary but not sufficient but also not resilient
- Carbon tax and wealth taxes. Invest revenue in sustainable infrastructure.
- Address all other misbehaviors – over exploitation, pollution, habitat destruction, etc.
- Address inequitable distribution of wealth and power by redistribution

Despair or care? Life is more interesting if you care.



Air Division 1, rr <airdivision1@deq.virginia.gov>

additional comments

1 message

Charlene Oba <chado108@icloud.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 11:18 PM

Please find attached my additional comments.

Thank you,
Chad Oba
c 434 806 6332

 **Air permit comments 9:21:2018.pdf**
98K

From: Toru and Chad Oba
571 Woods Rd
Buckingham, Va 23921
434 806 6332

Please find an additional comment to add to my previous one submitted on September 9,2018.

It has been brought to my attention that site suitability must be considered before approving an air permit. To this matter please consider the following:

A categorical exclusion cannot be used if one or more “extraordinary circumstance” applies, including actions that: - Affect human health or safety (including minority or low-income communities) - Affect areas with unique environmental characteristics, species or habitats protected by the ESA, the MMPA, the MSA, NMSA, or the Migratory Bird Treaty Act, significant properties/historic resources; - Involve hazardous or toxic substances; - Introduce/expand invasive species; - Violate laws or cannot be resolved through regulatory processes; - Effects are highly controversial or precedent-setting; - Effects that are uncertain, unique, or unknown; or - Cause significant cumulative impacts when the proposed action is combined with other past, present and reasonably foreseeable future actions, even though the impacts of the proposed action may not be significant by themselves.

https://www.deq.virginia.gov/Portals/0/DEQ/CoastalZoneManagement/GranteeGuidanceInformation/NEPA_EC_Procedures_Presentation_2018.pdf?ver=2018-02-27-120535-613

It would seem being that the site for the proposed compressor station is located in a low income majority African American neighborhood that is additionally populated by many elderly people and children who already have existing medical conditions that will be further worsened by being exposed on a regular basis to the emissions from the compressor station that this must be considered. This includes my husband and myself. In particular I have great concern for my husband who works outside for up to 10 hours daily and will be breathing the emissions for many years if we are forced to remain here because of lowered property values and the inability to financially afford to relocate. I do not believe that the standards in use despite your best efforts to lower them will not harm him and many others in our neighborhood.

From: Toru and Chad Oba
571 Woods Rd
Buckingham, Va 23921
434 806 6332

Additionally I offer the following from Physicians for Social Responsibility and attest to the accuracy of the actual populations as I participated as a community participant in a door to door demographic study that was headed up by Dr Lakshmi Fjord who is certified to do such a study.

It is incumbent on the Air Pollution Control Board to consider site suitability. There are multiple bases on which to conclude that Union Hill is an unsuitable place to situate the only Virginia compressor station for the Atlantic Coast Pipeline. These include:

- a. Environmental Justice concerns. The U.S. Environmental Protection Agency defines environmental justice as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” It seeks to address environmental discrimination, which can manifest as the placement of environmentally hazardous sites, including energy production facilities, in minority communities. The following characteristics of the Union Hill community, and the selection of that community for the location of the only Virginia compressor station on the Atlantic Coast Pipeline, indicate a likely environmental justice issue, with its attendant implications for health.
 - i. The population of Union Hill is predominantly minority: 83 percent self-identify as African American, Native American/African American, Native American/ White, Hispanic, or Asian.
 - ii. Many Union Hill residents belong to sub-populations, including infants and youth (32 percent) and elderly (25 percent), whose health is particularly vulnerable to the air pollutants emitted by compressor stations.
 - iii. The presence of preexisting medical conditions among the population of Union Hill calls for an environmental justice study of minority health effects. Known preexisting diagnoses identified in Union Hill include diabetes, asthma and other lung conditions, COPD, chronic bronchitis and pneumonia, heart conditions, breast and other cancers, lupus, kidney disease, epilepsy, multiple sclerosis, brain tumor, and migraines.

From: Toru and Chad Oba
571 Woods Rd
Buckingham, Va 23921
434 806 6332

- iv. The community faces disproportionate impact from the proposed compressor station. A decision was made to place the compressor stations for the Atlantic Coast Pipeline at greater distances from one another than is the industry standard. This requires that the compressor stations be unusually large and high-horsepower, thus concentrating an even higher amount of dangerous pollution in the communities where these facilities would be sited. The result is to inflict disproportionate environmental impact – and corresponding risks to health – on the minority communities of Union Hill and nearby Woods Corner.
- b. Population density. The population density in the immediate vicinity of the site proposed for the compressor station is far denser than is claimed by Dominion, which has stated “the site is sparsely populated” and has “29.6 people per square mile.” According to a site study that was independently conducted, there are in fact dense clusters of households on all sides of the proposed compressor station, with a population over six times greater than that applied for by Dominion. Not incidentally, Dominion stands to gain financially in making its claim, as the presence of only 29.6 people per square mile would allow Dominion to install pipes that are significantly thinner and to place shutoff valves up to 500% farther apart. Such decisions could endanger the relatively dense local populace in case of an accident or fire at the compressor station.
- c. Special historic significance. Preservation Virginia listed Union Hill/Woods Corner Rural Historic District on its list of “Most Endangered Historic Places” in May 2016. According to the National Trust for Historic Preservation, the Union Hill/Woods Corner Rural Historic District is a rural community that was established by African-Americans after Emancipation on former plantation land. PSR notes that the disregard being paid to the special historic value of this community, and the further deterioration of the historic community as a result of locating a hazardous site nearby, can contribute a stressor to the mental health of residents, increasing the stress likely to result from the location of the compression station in their neighborhood.

Thank you very much for your consideration of this as your decision to approve this air permit or not will have significant impacts on our future lives here in the Union Hill neighborhood of Buckingham County.

From: Toru and Chad Oba
571 Woods Rd
Buckingham, Va 23921
434 806 6332

Toru and Chad Oba



Air Division 1, rr <airdivision1@deq.virginia.gov>

Dominion's application for a permit to release air

1 message

Douglas Olson <malikmalik.me@gmail.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 5:59 PM

Virginia Air Pollution Control Board,

To whom it does concern:

I strongly request that you deny Dominion's application for a permit to release air that has been polluted.

If they are permitted to do so, it will threaten the health and well-being especially of residents in the Union Hill neighborhood and beyond.

Some of the major issues include:

- DEQ has failed to properly consider whether the placement of the facility is appropriate or to acknowledge the violation of environmental justice principles. This is a gross form of missed opportunity to provide justice for all. The disproportionate impacts the compressor station would have on the African American community in and around Union Hill are clearly shown. The Federal Energy Regulatory Commission (FERC) relied on incorrect and incomplete information about the local community to dismiss environmental justice and siting concerns. The Air Board must demand that DEQ provide and analyze correct data on these issues and must reject this permit unless and until the Department does so.
- The Atlantic Coast Pipeline (ACP) is not needed to supply energy to the areas Dominion claims would be served. Natural Gas Industry Admits New Pipelines Aren't Needed (<https://www.nrdc.org/experts/amy-mall/natural-gas-industry-admits-new-pipelines-arent-needed>, Natural Resources Defense Council, February 5, 2018. ("a spokesman for Williams, owner of the Transco pipeline, a would-be competitor of ACP, indicated 'the infrastructure is in place right now to meet the current demand.'"))

I appreciate your fair and honest consideration of the facts. What is needed for the residents of this beautiful state of Virginia and what is good for our environment in this case our Air Quality especially.

Thank you, kindly,

Douglas Olson
[513 Stewart St, Ste G](#)
[Charlottesville VA 22902](#)



Deny the Buckingham Compressor Station air permit

1 message

Diana & Larry Parker <erthshr@comcast.net>

Fri, Sep 21, 2018 at 9:56 AM

Reply-To: erthshr@comcast.net

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

I respectfully urge you to deny the draft minor source air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station.

This compressor station poses a direct threat to our climate, our air quality, and - most importantly - to the lives of the historic freedman and largely African American Union Hill community. If built, the compressor station would emit methane, nitrogen oxides, volatile organic compounds and particulate matter into the air in close range to community members' homes and would be a stark example of environmental racism at play in the Commonwealth.

We ask that you deny this permit and request that the following concerns be addressed:

- DEQ and the Air Board must ensure that the permit for the Buckingham Compressor Station does not disproportionately impact marginalized communities. However, the vast majority of residents in close proximity to the proposed compressor station site - 85% - are people of color, and a large proportion are elderly or very young. Therefore, a disproportionate impact on an environmental justice community is virtually guaranteed. If the project cannot be modified to avoid this outcome, the air permit should be denied.
- ACP has not shown that the amount of toxic air emissions from the compressor will not cause or contribute to the endangerment of human health. DEQ should conduct a baseline Health Impact Assessment to better understand what ailments already exist in the community that could be exacerbated by these emissions. The elderly, very young, and community members who already have respiratory health issues are particularly at risk.
- DEQ should require ACP to continuously monitor nitrogen oxide emissions to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ should conduct further analysis of the greenhouse gas emissions associated with this proposed compressor station. While Virginia is poised to begin regulating carbon dioxide emissions from electric power plants, ignoring the greenhouse gas emissions from the infrastructure used to supply those power plants is self-defeating. With each new pipeline and compressor station built, significant amounts of methane are emitted into the atmosphere, exacerbating climate change impacts. Though methane does not last in the atmosphere nearly as long as carbon dioxide, methane is much more efficient at capturing radiation than carbon dioxide and, pound for pound, the comparative impacts of methane to carbon dioxide are 25 times greater over a 100 year period. Greenhouse gas emissions are mentioned in the draft air permit, but further analysis of impacts and plans to mitigate those emissions are necessary.
- ACP has not adequately addressed emergency response plans. Detailed plans should be drafted and shared with the community. These plans should outline evacuation and actions in response to an explosion or other emergency at the Buckingham compressor station. At this time, there is no certainty that residents could be evacuated promptly, and Buckingham County emergency responders do not have the supplies or resources to respond to a significant industrial emergency.

It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station. I urge you to deny the permit.

Sincerely,

Diana & Larry Parker
10700 Chalkley Road
North Chesterfield, VA 23237
804-920-7842

**Deny the Buckingham Compressor Station air permit**

1 message

Holly Parker <hollyparker61@gmail.com>

Fri, Sep 21, 2018 at 6:02 PM

Reply-To: hollyparker61@gmail.com

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

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Sincerely,

Holly Parker
229 Blackberry Lane, Moon & Stars Farm
Staunton, VA 24401
5402920991



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Fred Parry <Fred.Parry.108978313@p2a.co>
Reply-To: fred.parry@dominionenergy.com
To: Ann Regn <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 4:22 PM

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Fred Parry
[47809 Saulty Dr](#)
[Sterling, VA 20165](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

David Peters <David.Peters.107626846@p2a.co>

Fri, Sep 21, 2018 at 4:23 PM

Reply-To: davidp9@verizon.net

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
David Peters
[37 W Carriage Hill Dr](#)
[Poquoson, VA 23662](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Bob Peyer <Bob.Peyer.112654920@p2a.co>
Reply-To: peyerbob@yahoo.com
To: Ann Regn <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 6:22 PM

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Bob Peyer
[4 Harbor Watch Drive](#)
[Chesapeake, VA 23320](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Robert Pugh <Robert.Pugh.15490920@p2a.co>

Fri, Sep 21, 2018 at 7:59 PM

Reply-To: heelsfan61@yahoo.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Robert Pugh
[4504 Morninghill Dr](#)
[Disputanta, VA 23842](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Robert Pugh <Robert.Pugh.15490920@p2a.co>

Fri, Sep 21, 2018 at 8:01 PM

Reply-To: heelsfan61@yahoo.com

To: Ann Regn <airdivision1@deq.virginia.gov>

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Regards,
Robert Pugh
[4504 Morninghill Dr](#)
[Disputanta, VA 23842](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Permit to release air pollution

1 message

Toni Ranieri <toniranierishannon@gmail.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 1:04 AM

I am one more person asking you not to grant Dominion 's
Application for a permit to release air pollution into the neighborhood of Union Hill.
Please realize that this project
Is already archaic and will not serve the public as well as other means of energy production and transport. Many states
are moving forward with other types of energy producing projects that are not as polluting. Why would you allow Dominion
to put Virginia in this bind for years to come.



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Daniel Raveia <Daniel.Raveia.117846472@p2a.co>

Fri, Sep 21, 2018 at 9:01 PM

Reply-To: draveia@hotmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Daniel Raveia
[4205 Pickett Road](#)
[Fairfax, VA 22032](#)

**Deny the Buckingham Compressor Station air permit**

1 message

Elizabeth Reyes <betsyreyes@gmail.com>

Fri, Sep 21, 2018 at 12:24 PM

Reply-To: betsyreyes@gmail.com

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

I respectfully urge you to deny the draft minor source air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station.

This compressor station poses a direct threat to our climate, our air quality, and - most importantly - to the lives of the historic freedman and largely African American Union Hill community. If built, the compressor station would emit methane, nitrogen oxides, volatile organic compounds and particulate matter into the air in close range to community members' homes and would be a stark example of environmental racism at play in the Commonwealth.

We ask that you deny this permit and request that the following concerns be addressed:

- DEQ and the Air Board must ensure that the permit for the Buckingham Compressor Station does not disproportionately impact marginalized communities. However, the vast majority of residents in close proximity to the proposed compressor station site - 85% - are people of color, and a large proportion are elderly or very young. Therefore, a disproportionate impact on an environmental justice community is virtually guaranteed. If the project cannot be modified to avoid this outcome, the air permit should be denied.
- ACP has not shown that the amount of toxic air emissions from the compressor will not cause or contribute to the endangerment of human health. DEQ should conduct a baseline Health Impact Assessment to better understand what ailments already exist in the community that could be exacerbated by these emissions. The elderly, very young, and community members who already have respiratory health issues are particularly at risk.
- DEQ should require ACP to continuously monitor nitrogen oxide emissions to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ should conduct further analysis of the greenhouse gas emissions associated with this proposed compressor station. While Virginia is poised to begin regulating carbon dioxide emissions from electric power plants, ignoring the greenhouse gas emissions from the infrastructure used to supply those power plants is self-defeating. With each new pipeline and compressor station built, significant amounts of methane are emitted into the atmosphere, exacerbating climate change impacts. Though methane does not last in the atmosphere nearly as long as carbon dioxide, methane is much more efficient at capturing radiation than carbon dioxide and, pound for pound, the comparative impacts of methane to carbon dioxide are 25 times greater over a 100 year period. Greenhouse gas emissions are mentioned in the draft air permit, but further analysis of impacts and plans to mitigate those emissions are necessary.
- ACP has not adequately addressed emergency response plans. Detailed plans should be drafted and shared with the community. These plans should outline evacuation and actions in response to an explosion or other emergency at the Buckingham compressor station. At this time, there is no certainty that residents could be evacuated promptly, and Buckingham County emergency responders do not have the supplies or resources to respond to a significant industrial emergency.

It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station. I urge you to deny the permit.

Sincerely,

Elizabeth Reyes
535 Via Estrada Unit A
Laguna Woods, CA 92637
9195997850



Deny the Buckingham Compressor Station air permit

1 message

Rebecca Richardson <Rebeccalkrichardson@gmail.com>

Fri, Sep 21, 2018 at 1:31 PM

Reply-To: Rebeccalkrichardson@gmail.com

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

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It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station. I urge you to deny the permit.

Sincerely,

Rebecca Richardson
3026 Garland Ave
Richmond, VA 23222
7574728962



Air Division 1, rr <airdivision1@deq.virginia.gov>

Comments from Mara Robbins on the Buckingham Compressor Station

1 message

Mara Robbins <mara.robbins@gmail.com>

Fri, Sep 21, 2018 at 11:37 PM

To: airdivision1@deq.virginia.gov, michael.dowd@deq.virginia.gov, patrick.corbett@deq.virginia.gov

Dear Citizen's Air Pollution Control Board:

In my comments I am focusing primarily on the effects of compressor stations on the brains of children. Dr. Ralph Northam, the governor who appointed you to your position, was a pediatric neurologist before he took his oath of office. If you have any questions about the material I am about to share with you, I suggest you ask him for his explanations. He should know better than most what sort of effects industrial chemicals have on children. I would also remind him that the first oath he took was to "do no harm."

I would like to offer you a quote which helps to sum up my perspective on this issue. "I hope that we use this moment as a way to step up to the plate... I would like to see our political leaders quit playing politics. And I'd like to see them start playing "let's protect the public and let's do what we're supposed to do." Jeffrey Griffiths is a Professor of Public Health and Community Medicine at Tufts University School of Medicine and has written extensively on those subjects, as well as on the health effects of climate change.

Fact: the chemical contaminants released from this compressor station would be harmful to children's brains. The compressor station would emit tremendous levels of air pollution, including, but not limited to: nitrogen oxides, carbon monoxide, sulfur dioxide, volatile organic compounds, particulate matter and hazardous air pollutants.

And these are just the ones we know about. As indicated in this study: "The researchers believe that the total impact of the pandemic is much greater than currently recognized. In supplementary documentation, about half of the 202 chemicals known to be toxic to the brain are among the chemicals most commonly used.

Testing chemicals for toxicity is a highly efficient public health measure. However, less than half of the thousands of chemicals currently used in commerce have been tested to assess acute toxicity and, although new chemicals undergo more thorough testing, access to the data may be restricted because companies fear exposing proprietary information. Also, current toxicity testing rarely includes neurobehavioral functions."

We already know that the industry is [not required to reveal the toxic cocktails utilized in the fracking process](#). How is it possible to even conduct testing about the potential health

effects if we, A) do not know the ingredients to test for and B) less than half of them have even been tested?

It is chilling to note that: "The researchers found that 202 industrial chemicals have the capacity to damage the human brain, and they conclude that chemical pollution may have harmed the brains of millions of children worldwide. The authors conclude further that the toxic effects of industrial chemicals on children have generally been overlooked.

"Even if substantial documentation on their toxicity is available, most chemicals are not regulated to protect the developing brain," says Grandjean. "Only a few substances, such as lead and mercury, are controlled with the purpose of protecting children. The 200 other chemicals that are known to be toxic to the human brain are not regulated to prevent adverse effects on the fetus or a small child."

Though I have chosen to focus primarily on brain damage in children due to compressor stations, there are many other health effects applicable to the entire population of the commonwealth that deserve attention. I suggest you review this [comprehensive report](#) extensively and pay special attention to this quote:

"Pipelines and compressor stations bring with them a host of health risks and dangers. Communities of color and low income have long been targeted for disruptive infrastructure projects and polluting facilities - including pipelines and compressor stations - that cause health problems for the surrounding community. The specific volatile organic compounds (VOCs) that are emitted by compressor stations have been associated with several serious health problems, including cancers, respiratory and cardiovascular illness, and birth defects . The health complaints of residents near these facilities have been consistent. The difficulty in directly correlating health complaints with exposure to emissions may be partly due to the failure to collect information about intermittent peak exposures. Toxic air emissions are often reported as averages over a year, which fails to account for shorter, more intense incidents of exposure that can cause more damage than a consistent, lower average exposure. The annual averaging of emissions also fails to account for how cumulative periods of exposure can cause cumulative damage, nor do current measurement practices account for varying health impacts based on proximity to a source of emissions. Emissions are often averaged over a several-mile radius, yet residents close to processing stations will necessarily experience higher exposures. One peer reviewed study specific to PA compressor stations found that "distance to industrial sites correlated with the prevalence of health symptoms. For example, when a gas well, compressor station, and/or impoundment pit were 1500-4000 feet away, 27 percent of participants reported throat irritation; this increased to 63 percent at 501-1500 feet and to 74 percent at less than 500 feet. At the farther distance, 37 percent reported sinus problems; this increased to 53 percent at the middle distance and 70 percent at the shortest distance. Severe headaches were reported by 30 percent of respondents at the farther distance, but by about 60 percent at the middle and short

distances."Residents living near natural gas compressor stations also report symptoms consistent with inhalation of harmful emissions. The specific chemicals emitted by compressor stations vary from site to site. In Dish, TX, some chemicals identified as exceeding Texas's ambient air standards, measured at a variety of locations near and on residential properties include: benzene, dimethyl disulfide, methyl ethyl disulphide, ethyl-methylethyl disulfide, trimethyl benzene, diethyl benzene, methyl-methylethyl benzene, tetramethyl benzene, naphthalene 1,2,4-trimethyl benzene, m-&p- xylenes, carbonyl sulfide, carbon disulfide, methyl pyridine, dimethyl pyridine."

This is another comprehensive study that should be reviewed before you make your decision. It illustrates the health impacts irrefutably.

As you make your decision, consider these questions raised by a panel discussion on Chemical Exposures and the Brain: "Are potentially neurotoxic compounds being introduced so fast, in terms of just the industry moving so fast, that we can't keep up with them? Are they so embedded in our infrastructure that it's impossible to get them out? Or is there some kind of bigger failure of political will to address these problems, prevent them before they happen, or at least deal with them after they've already become obvious?"

The answer to those questions are obvious to me; if there were not a failure of political will involved in this decision and a willingness to sacrifice the health and safety of our children for the sake of profit, you would not be considering the permit in front of you right now at all.

As a citizens board, it is your responsibility to protect the citizens of the commonwealth of Virginia. This compressor station cannot be built without causing irrevocable harm. Do the right thing. Deny the permit.

Sincerely,

Mara Robbins
Floyd County, Virginia

Links included:

<http://sites.tufts.edu/medicine/summer-2014/just-warming-up/>

<https://theforum.sph.harvard.edu/events/chemical-exposures-and-the-brain/>

Table C-9 of the updated permit application submitted to Virginia DEQ on June 17, 2016 by Dominion Transmission, Inc.
https://www.deq.virginia.gov/Portals/0/DEQ/Air/Permitting/TitleVPermits/71978_permit.pdf

<http://archive.sph.harvard.edu/press-releases/2006-releases/press11072006.html>

<http://frackfreenc.org/wp-content/uploads/Dangerous-Neighbors-Final-6-8-2016.pdf>

<https://www.docdroid.net/rJdRIs2/summary-on-compressor-stations-and-health-impacts-22415.pdf>

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9/28/2018

Commonwealth of Virginia Mail - Comments from Mara Robbins on the Buckingham Compressor Station

Mara Robbins
(540) 808-8357

“Grace happens when we act with others on behalf of our world.”

— Joanna Macy

Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Neil Robinson <Neil.Robinson.108979907@p2a.co>

Fri, Sep 21, 2018 at 11:41 PM

Reply-To: narwv79@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Neil Robinson
[10306 Brickerton Dr](#)
[Mechanicsville, VA 23116](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP is safe and necessary

1 message

Alberto Rodriguez <Alberto.Rodriguez.126717493@p2a.co>

Fri, Sep 21, 2018 at 5:41 PM

Reply-To: albertoarcos1961@hotmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

Doing the right thing for our communities, our economy, and our environment is a balancing act. That's why a project as important as the Atlantic Coast Pipeline isn't built overnight. Rather, this project has gone through more than three years of careful planning and thorough scrutiny from agencies and organizations at every level.

Because of that exhaustive planning, the ACP is the safest way for us to get affordable, cleaner natural gas to those in our region who desperately need it.

The Buckingham Compressor Station is an integral part of the ACP project. The compressor station's "best in class" engineering design, and advanced emissions control equipment will ensure the facility will fully protect Virginia's air quality. In fact, modeling has demonstrated that the station's emissions, even when the facility is operating at its maximum, will not adversely impact Virginia's air quality. The modeling was conducted using methods approved by DEQ and has proven reliable thus far.

I believe that the stringency of the air quality permit that the ACP project has already passed will keep our community safe—while still allowing us to move forward with producing cleaner and more affordable American energy.

Accordingly, in the case of the recent discussions by the State Water Control Board regarding the state's use of the Army Corps of Engineers Nationwide Permit 12, I believe revisiting the existing process would be a mistake.

Our state's environment and our business climate have prospered from a consistent, predictable regulatory climate and from federal and state partnerships to allow scarce regulatory resources to be put to optimal use. There is no need to change the current approach.

Sincerely,
Alberto Rodriguez
2244 Taft Cir
Winchester, VA 22601

--

Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Mike Rose <Mike.Rose.107871916@p2a.co>

Fri, Sep 21, 2018 at 7:34 PM

Reply-To: rm.rose227@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Mike Rose
[2513 Savage View Dr](#)
[Midlothian, VA 23112](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station Comments

1 message

Chris Saxman <csaxman@vafree.org>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 3:50 PM

Please accept this letter on behalf of Virginia FREE.

Chris Saxman

 **DEQ - Buckingham.docx**
10K

September 21, 2018

Virginia Department of Environmental Quality

Piedmont Regional Office

4949-A Cox Road

Glen Allen, VA 23060

RE: Buckingham Compressor Station

Dear Department of Environmental Quality:

On behalf of Virginia FREE , I appreciate this opportunity to submit our comments on the draft air quality permit for the Buckingham Compressor Station. As you know, the station is an integral part of the Atlantic Coast Pipeline, and Virginia FREE, along with many other members of the Commonwealth's business community, have strongly supported the project. We believe our state's continued economic health and growth depends upon a secure, reliable and affordable supply of energy. The pipeline is a key to achieving that goal.

However, Virginia FREE could not support the project, no matter how attractive it might be from an energy standpoint, if we felt it had the potential to permanently damage Virginia's environment. Fortunately, we have no such concerns. We are impressed by the developers' commitment to protecting our natural resources. We are equally impressed with the thoroughness and dedication your department has brought to reviewing the ACP's environmental impacts and your willingness to take strong steps to ensure those impacts are held to an absolute minimum. You have shown that same dedication in developing the draft air permit.

We are very pleased with the strict emissions limits included in the draft. Although the station is classified under federal and state regulations as a "minor" source of emissions, we are told that the limits included in the draft permit are much more typical of those imposed on larger facilities with much higher emissions levels. In fact, we understand that the limits in the draft Buckingham permit are four to 10 times stricter than the limits in any other permit recently issued for compressor stations in Virginia. These stringent limits apply to regulated emissions ranging from nitrogen oxides to volatile organic compounds to carbon monoxide, and they will help ensure that Virginia's air remains clean and healthy even as we expand our energy infrastructure.

Additionally, we are impressed by the control technology required by the draft permit. Here again, these controls are more typical of those mandated for much larger facilities with higher levels of emissions. The systems included in the draft permit cover an impressive range from selective catalytic reduction to as vent gas recovery system designed to minimize the release of natural gas into the atmosphere. We are confident that the developers will carry out the permit's strong requirements for air quality protection.

The Virginia Department of Environmental Quality has worked hard for many years to ensure that future generations of Virginians will have clean water and air. We applaud you for continuing that work through the terms and conditions in the draft Buckingham air permit. Virginia FREE again thanks you for the opportunity to offer our comments on this important regulatory matter.

Sincerely,

Chris Saxman

Executive Director

Virginia FREE



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Gregory Searcy <Gregory.Searcy.116034302@p2a.co>

Fri, Sep 21, 2018 at 4:27 PM

Reply-To: searcys5golive@aol.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Gregory Searcy
[1707 Rising Sun Rd](#)
[Palmyra, VA 22963](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

MD Seaton <MD.Seaton.116102685@p2a.co>

Fri, Sep 21, 2018 at 5:57 PM

Reply-To: pnh1@yahoo.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
MD Seaton
[25 Wellington Pl](#)
[Waynesboro, VA 22980](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Fwd: Message from "RNP0026737F7192"

1 message

Queen Shabazz <qshabazz@vaejc.org>

Fri, Sep 21, 2018 at 12:52 PM

To: airdivision1@deq.virginia.gov, harris.reggie@epa.gov, constituent.services@governor.virginia.gov, suzanne.buchanan@usdoj.gov, ann.regn@deq.virginia.gov, michael.dowd@deq.virginia.gov, bcarter@buckinghamcounty.virginia, thomas.jordan.miles@gmail.com, Karen Campblin <ktc1426@gmail.com>, jeddins@achp.gov, marcwagner@drh.virginia.gov

Re: BUCKINGHAM COMPRESSOR STATION

Permit Name: Minor Source Construction Permit issued under the authority of the Air Pollution Control Board

Applicant Name and Registration Number: Atlantic Coast Pipeline, LLC; 21599

Facility Name and Address: ACP - Dominion Energy Buckingham Compressor Station; 5297 S. James River Highway, Wingina, VA 24599

On behalf of the Virginia Environmental Justice Collaborative (VEJC), I am submitting the attached letter dated 10 September 2018 along with signatories, to express our shared concerns of Environmental Justice or the lack thereof in the state of Virginia.

Please do not hesitate to contact me, Queen Zakia Shabazz, Coordinator, with any responses or items needing clarity.

Queen Zakia Shabazz, Coordinator
Virginia Environmental Justice Collaborative
804.308.1518

----- Forwarded message -----

From: **Queen** <qshabazz@vaejc.org>

Date: Fri, Sep 21, 2018 at 11:33 AM

Subject: Message from "RNP0026737F7192"

To: Queen <qshabazz@vaejc.org>

This E-mail was sent from "RNP0026737F7192" (MP C4503).

Scan Date: 09.21.2018 11:34:03 (-0400)

**20180921113403196.pdf**

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VIRGINIA ENVIRONMENTAL JUSTICE COLLABORATIVE
220 Hull Street, Richmond, VA 23224
www.vaejc.com
804.370.1143

September 10, 2018

Dear Governor Northam, Senators Warner and Kaine, Virginia State Legislators
cc: Federal Energy Regulatory Commissioners, Dominion Resources, Meryem Karad, Trieste Longwood (DEQ)

We are alarmed civil rights, community-based, environmental, and faith-based organizations who make up the Virginia Environmental Justice Collaborative (VEJC), along with institutional partners, civil rights advocates, consumers, impacted residents, and frontline marginalized communities throughout the Commonwealth. Environmental justice is falling through the cracks because each federal or state agency limits its permitting and regulatory authority to fragmented fields of expertise (air *or* water; air *not* safety or noise pollution).

This approach excludes comprehensive study of the cumulative risks and hazards faced by impacted residents, and supports denial of responsibility for environmental justice implementation. Thus, EJ communities remain targets for new burdens of toxic infrastructure in Virginia. Travesties in two of these communities have prompted this letter and our strong recommendations for immediate actions by you.

The Environmental Protection Agency (EPA) defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws,

regulations, and policies. NEPA guidelines detail how to implement environmental justice reviews, including:¹

- ❖ Identification and assessment of environmental justice communities using multiple methods, including inclusive local sources to ensure accuracy;
- ❖ Early, meaningful, inclusive, participatory engagement of impacted communities;
- ❖ Identification and protection of African American, Native American, and other cultural and historical resources;
- ❖ Comprehensive analysis of the cumulative impacts of air, soil, and water exposures and their combined risks to human health over time, with particular emphasis on vulnerable populations -- elderly, pediatric, minority, and low-income residents;
- ❖ Assessment of pre-existing medical conditions of fence-line neighborhoods;
- ❖ Equitable access to alternative energy and green infrastructure to reduce toxic burdens.

Virginia Energy Policy (Code of Virginia § 67-101) energy objectives include “[developing energy resources and facilities in a manner that does not impose a disproportionate adverse impact on economically disadvantaged or minority communities.”² In 2017, Governor Terry McAuliffe created the Governor’s Advisory Council on Environmental Justice (ACEJ) under Executive Order #73, to provide “a consistent, action-oriented approach to incorporating environmental justice into decision-making.” Governor Northam’s Executive Order #6 includes: “Engaging the regulated community, local governments, and other interested stakeholders in the development of new protocols”; and, “assessing gaps in DEQ resources or authorities necessary to address challenges identified under this review.”

These commitments by Virginia to resolve the environmental and social injustices identified below demand that energy generation choices give highest priority to the health and safety of the public through equitable access to community-oriented renewable energy.

Buckingham Environmental Justice Review

Union Hill is not suitable for a gas compressor station because of geometric comprehensive and cumulative impacts to air, soil, and 100% of drinking water sources with:

- ACP Intersection with existing 4-pipeline William’s Transcontinental (Transco) at the Union Hill Compressor Station in a large wetlands close to water wells, homes, churches;
- A proposed 54,000+ horsepower compressor station is sited for a majority African American community over 500% more populated than reported by Atlantic Coast Pipeline (ACP) and the Federal Energy Regulatory Commission (FERC),

¹ https://www.epa.gov/sites/production/files/2016-08/documents/nepa_promising_practices_document_2016.pdf

² <https://law.lis.virginia.gov/vacode/title67/chapter1/section67-101/>

- ACP's horizontal directional drilling at a seasonal flooding, seismic faultline site under the James River risks entire watershed drinking water;
- ❖ The African American Freedman community of Union Hill lacks historical preservation of historic black schools, churches, slave burials, and gathering places;
- ❖ According to state data and household studies, pre-existing health conditions in proximate households include asthma, chronic bronchitis and other lung disorders, heart disease, diabetes, cancers, and autoimmune conditions;
- ❖ Residents of Union Hill are disproportionately elderly and very young; in all public comment processes impacted residents give strong dissent with specific data for why not to allow a large compressor station in a minority, Freedmen community;
- ❖ Emergency first response infrastructure in Buckingham is inadequate for industrial scale leaks, fires or explosions.³

We request a 30-day extension of the 30-day comment period for the draft air permit for Union Hill Compressor Station because:

- ❖ Community members received access to large documents only weeks before the comment period is set to end; unlike ACP's developer, they did not receive DEQ expert technical support to frame the technological and emissions issues DEQ staff said are the only issues they will read and summarize in public comments;
- ❖ Yet, the lack of organization, lack of tables, and overall impenetrable language in hundreds of pages of the air permit and air modeling require the same level of support Dominion received from DEQ to comprehend;
- ❖ The lack of access to computers and internet by the Union Hill community, coupled with lack of access to rural wifi or broadband infrastructure, compounds inequity.

Chesapeake Environmental Justice Review

Likewise, the Chesapeake and Norfolk lateral pipeline route and process are not appropriate:

- ❖ The siting of a new lateral gas pipeline route in Chesapeake and Norfolk demonstrates targeted impact to majority African American neighborhoods. Many residents purchased homes in these neighborhoods in the late 1960's - early 1970's when other neighborhoods were redlined and they were prohibited from buying elsewhere. Now, those same residents are seniors and unable to move without losing their lifelong investment while others who are able are selling their homes which could still reduce home values;
- ❖ A coalition of Chesapeake subdivisions commissioned a professional environmental study at their own expense. The report determined that should there be an explosion, there are hundreds of homes within potential blast zone.

³ Based on household surveys, Union Hill has a suburban population density. It is cited incorrectly in project documents as rural.

- ❖ New pipeline is being constructed in a neighborhood that is already in nonattainment for air and water standards⁴ with proximity to superfund sites tied to military installations⁵ and to Chesapeake Energy Center's unlined storage ponds with 3 million tons of coal ash leaching arsenic into groundwater.⁶
- ❖ In order to expedite construction, company officials rushed eminent domain property takings; impacted landowners were improperly informed and offered inadequate compensation;⁷
- ❖ Six public schools - including three elementary schools - lie within the incineration/blast zones of the gas pipelines currently under construction; **the School Board was not aware of the plans until community members voiced their concerns at a recent school board meeting well after construction was already underway. To date, parents of students have still not been notified; and**
- ❖ Community members have not been adequately informed about both its existence and the known risks of gas pipelines and their construction hazards: residents generally thought the new pipes are water lines or infrastructure without risk of explosion.⁸

For these two EJ communities, we recommend Governor Northam immediately create:

An Interagency Task Force with involvement of impacted residents to look at and take actions to reduce or avoid the comprehensive impacts of the lateral and ACP pipelines and the Virginia ACP compressor station, since no existing agency has authority to address cumulative air, water, and land releases and exposures; to divide and oversee completion of these tasks:

1. Undertake: a. Quantitative Risk Assessments (QRA), b. Comprehensive Health Impact Assessments (CHIA), and c. Statements of Impact which taken together address the environmental justice, public health and safety, and cumulative hazards faced by residents of Buckingham (Appendix 1) and Chesapeake;
2. Extend the comment period for the Union Hill Compressor Station air permit to 60 days;
3. Require Dominion Energy to allow Union Hill community representative(s) to enter the Union Hill Compressor Station site to locate unmarked slave burial gravesites and to have gravesites and other archaeological resources surveyed by an independent or public surveyor for the purposes of historic preservation;

⁴ https://pilotonline.com/news/government/local/article_33929ed5-ed53-5d7e-8623-35e70d26c6bb.html

⁵ <https://response.restoration.noaa.gov/about/media/chesapeake-bay-overcoming-unique-challenges-bringing-restoration-polluted-military-sites>

⁶ <https://www.wavy.com/news/local-news/chesapeake/appeals-court-hears-chesapeake-coal-ash-storage-case/1066322252>

⁷ https://pilotonline.com/news/local/article_35553a50-cc46-5e36-bfaf-79cd77cf2b9d.html

⁸ PHMSA records annual pipeline incidents, including fatalities and costs.
<https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Portalpages>

4. Undertake and make public baseline analyses of present drinking water, ambient air, transportation and existing health in these communities; and make that data available to the public without incurring delays and costs of FOIA;
5. Immediately notify parents of public school students at schools located in the blast radius of the Chesapeake lateral connection and Union Hill compressor station, and address concerns they raise; and
6. Require developer-funded bonds for both projects to be held in escrow for Impacted Families to apply for direct assistance who experience any adverse health, mortality, economic, educational impacts or true market relocation costs.

For all infrastructure projects, we recommend :

1. Meaningful participation by impacted populations in permitting and monitoring including effective responses to citizen concerns as per Exec. Order #6;
2. Evaluation of climate and environmental justice impacts in all state policies, programs, and permits;
3. Reduction of state disparity in exposure by which black and brown communities disproportionately experience harm from toxic air, unsafe water, and public safety risks;
4. Development of equitable access to renewable energy sources (Appendix 2)
5. Creation of an interagency Task Force with involvement of impacted residents to look at and take actions to reduce or avoid the comprehensive impacts of the lateral and ACP pipelines and the Virginia ACP compressor station, since no existing agency has authority to address cumulative air, water, and land releases and exposures;

Signatories

Groups

Virginia Environmental Justice Collaborative (by consensus)
 Friends of Buckingham
 Virginia Interfaith Power & Light
 Center for Sustainable Communities
 Appalachian Voices
 United Parents Against Lead & Other Environmental Hazards
 Virginia Organizing
 First Alliance Consulting Group LLC.
 Sierra Club Virginia Chapter
 Buckingham: We The People
 Chesapeake Climate Action Network
 Water is life. Protect it.

Allegheny-Blue Ridge Alliance
Highlanders for Responsible Development
Interfaith Alliance for Climate Justice
Friends of Nelson
Yogaville Environmental Solutions
Augusta County Alliance
RVA Interfaith Climate Justice League
Mothers Out Front, Hampton Roads
Virginia Pipeline Resisters
Voices from Bath
350 Loudon
RAPTORS VA
Protect Our Water Heritage and Rights (POWHR) Coalition
Preserve Giles
Harrisonburg-Rockingham County NAACP
Sacred Ground Historical Reclamation Project
Virginia Defenders for Freedom, Justice & Equality

Individuals


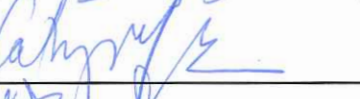




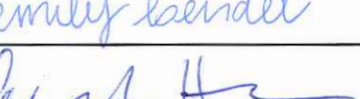
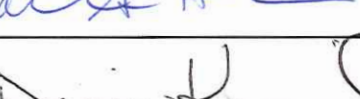




Swami Dayananda, LOTUS Center for all Faiths, Yogaville, Buckingham
Rev. Dr. Lakshmi Fjord, Friends of Buckingham; Chair: People's Tribunal on Human Rights and Environmental Justice Impacts of ACP and MVP
Queen Zakia Shabazz, Coordinator, Virginia Environmental Justice Collaborative
BeKura W. Shabazz, Founder, First Alliance Consulting LLC
Dr. Mary Finley-Brook, University of Richmond, Richmond
Dr. Irene Leech, Buckingham
Chad Oba, Heidi Dhivya Berthoud, Friends of Buckingham, Buckingham
Alexis Szepesy, Sierra Club Virginia Chapter
Suzanne Keller, retired epidemiologist
Hanuman, Heidi Dhivya Berthoud, Buckingham: We the People
Robert Dilday and Weston Mathews, Co-Directors Interfaith Alliance for Climate Justice
Ben Cunningham, Blue Ridge GeoGraphics, LLC
Kimberly Williams, Norfolk, VA
Steven Baggarly, Norfolk VA
Stacy Lovelace and Jessica Sims, Co-Directors Virginia Pipeline Resisters
Natalie Pien, Unitarian Universalist Church of Loudoun, Green Team Chair
Jonathan Sokolow, Attorney, Reston, VA
Russell Chisholm, Executive Committee Member of POWHR Coalition, Newport, VA

Petition to Virginia Department of Environmental Quality, September 2018

We the undersigned, in support of the citizens residing on Union Hill Rd, Shelton Store Rd, James River Highway and Woods Rd, and the community of Yogaville, communities that would be directly impacted by the proposed site of the Atlantic Coast Pipeline Buckingham Compressor Station, ask that:

The Department of Environmental Quality should immediately complete a Quantified Risk Assessment (QRA) for the Buckingham Compressor Station prior to permitting and to work with other state agencies to conduct a Health Risk Assessment (HRA) and a Comprehensive Health Impact Assessment (CHRI).

Respectfully submitted by:

Date	Printed Name	Signature	Full Address	Email/Phone #
9/8/18	Peter Anderson		100 N. Baker St Charlottesville, VA 22903	mail.peteranderson@gmail.com 434-249-6446
9/8/18	Col. McCue		1015 Cambridge Circle Charlottesville 22903	ccatbize@gmail.com 434-293-6373
9/8/18	NATE BENFORADO		1312 ROSE HILL DR CHARLOTTESVILLE, VA 22903	nate.benforado@gmail.com 434 977 4090
9/8/18	Sam Laveson		3703 Chanel Rd Annandale, VA 22003	slaveson@email.wm.edu 571-205-6709
9/8/18	Leah Marshall		1422 Kenting Ln. Charlottesville, VA 22903	leah.p.marshall@gmail.com 434-305-9608
9/8/18	Madeline Salino		14 Chestnut Dr. Central Valley, NY 10917	mnsalino@email.wm.edu 845 637 5652
9/8/18	EMILY BENDER		4923 Friedens Church Rd Mount Crawford, Virginia 22841	emily.harvey.10@gmail.com
9/8/18	Courtney Harlow		9800 St. Pags Ln. Henrico, VA 23230	harlowca90@gmail.com
9/8/18	Diana Kregiel		120 Zelkova Rd Williamsburg VA 23185	diana.kk0704@gmail.com 757-477-105
9/8/18	Marcia Geyer		1008 Peartree Lane Charlottesville, VA 22901	marcia.geyer2@gmail.com 434 980-6660
9/8/18	Jane Bren		404 Baldwin Rd Lexington, VA 23229	janebren1@gmail.com 604-288-6345
9/8/18	Elizabeth		3800 Daryl Drive Midlothian VA 23113	trigelsed@comcast.net

Petition to Virginia Department of Environmental Quality, September 2018

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Respectfully submitted by:












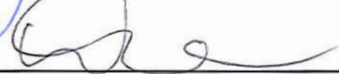
Date	Printed Name	Signature	Full Address	Email/Phone #
9/8/18	PENNY MALLIS	Penny Mallis	3100 Shore Drive Apt 765 Virginia Beach, VA 23451	penny.dancer@gmail.com 757-217-2279
9/8/18	Lynnda Strickler	Lynnda Strickler	1124 Windsor Road Po. Beach, VA. 23451	lgs92cox.net
9/8/18	NANCY K. DICKERSON	Nancy K. Dickerson	247 Archers Mead Wmnsb., VA. 23185	nancyknew@cox.net
9/8/18	Eileen Woll	Eileen Woll	220 N. Shore Rd. Norfolk, VA 23505	eileen.woll@cox.net
9/8/18	Kevin Rivera	Kevin Rivera	420 McIlmoe Tr. Apt #4, B1 Williamsburg, VA 23185	Krivera222@gmail.com
9/8/18	Brianna Key	Brianna Key	111 Meadow Creek Dr. Thaxton Va 24174	bkey@email.wm.edu
9/8/18	Phillip Musegoas	Phillip Musegoas	Potomac Riverkeeper Network Berryville, VA	phillip@prknetwork.org
9/8/18	William Espinoza	William Espinoza	208 Coltleast Charlottesville, VA	whe@williamespinoza.co
9/8/18	TERESA Blackwelder	Teresa Blackwelder	3517 Rockman St. NW Washington, DC 20008	
9/8/18	Neel Simpson	Neel Simpson	243 S Sternbach St. Vienna VA	
9/8/18	Albert Black	Albert Black	48 Skelton Rd Virginia 22480	
9/8/18	Beth Offenbacher	Beth Offenbacher	4201 36th Sts, Arlington VA 22206	bethoffenbacher@gmail.com

Petition to Virginia Department of Environmental Quality, September 2018

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Respectfully submitted by:

Date	Printed Name	Signature	Full Address	Email/Phone #
9/8/18	Tyla Matteson		4896 N. Chesterfield VA Burnham Rd. 23234	tmatteson1@windstream.net 804-275-6476
	Karla Loeb		1222 Harris St. Charlottesville, VA 28903	
	Ali Symons		2128 Greenwich St. Falls Church, VA 22043	ali.a@jhu.edu 202-415-4239
	Elizabeth Stevens		612 N MAIN ST GORDONSVILLE, VA 22942	estevens@vaip.org 540-223-3164
	Brittany Wright		608 Admiral Dine Apt 476 Annapolis MD 21401	Dr. Hary Wright @ gmail.com 301-367-0830
	Morgan Schmidtendorff		2201 Dinwiddie Rd. Virginia Beach, VA 23455	mmschmidtendorff@gmail.com 269.808.6326
	Pete Gates		124 Piedmont Ave. Charlottesville, VA 22903	Ptg3la@gmail.com 434-282-6350
	Calandra Waters Lake		119 Rich Neck Rd Williamsburg, Va 23185	703-517-1842 waterslake@gmail.com
	Corrina Beall		2200 Barton Ave Richmond, VA 23222	CORRINA.BEALL@ SIERRACLUB.ORG
	Kristin Reilly		3306 Arundel on the Bay Rd Annapolis, MD 21403	Kristin.Foringere@gmail.com
	James Baxter		816 Corn. Ave. NW Washington, DC 20006	jbxater@princeton.edu
	Diana Smith			DL5M174

[illegible]

Petition to Virginia Department of Environmental Quality, September 2018

We the undersigned, in support of the citizens residing on Union Hill Rd, Shelton Store Rd, James River Highway and Woods Rd, and the community of Yogaville, communities that would be directly impacted by the proposed site of the Atlantic Coast Pipeline Buckingham Compressor Station, ask that:

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Respectfully submitted by:

[illegible]



Air Division 1, rr <airdivision1@deq.virginia.gov>

Please Deny the Buckingham Co acp Proposed Compressor Air Permit1 message

Dianna <lunarblessings13@gmail.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 11:25 PM

To whom it may concern at the DEQ Air Board,

Please extend the comment period for this permit for 30 days to give more Union Hill and Buckingham Co residents more time to comment on this extremely important topic.

Please utilize your role and the oath you took to protect the air and prevent huge amounts of toxic chemicals from being expelled into the air.

The proposed placement of this compressor station is an absolute form of environmental racism. Both the NAACP and Northam's own Environmental Advisory Council have come out in opposition of this proposed site due to the detriments to the health of the Union Hill community and the communities surrounding Union Hill.

As a physician licensed by the Virginia Medical Board and as a parent, I respectfully plead that you use the power given to you and stand on the correct side of history. Please protect the health of our communities, our children, and our generations to come. The time is now to dig deep into your moral core to stand with the citizens not with the profits of corporations who repeatedly and carelessly destroy essential aspects of life to push forward their profits. This proposed compressor station is all pain and no gain for the residents of Union Hill. The practice of profits over people has got to stop.

Thank you for taking the time to read my statement in opposition the dangers affiliated with the acp proposed compressor station.

PLEASE, PLEASE, PLEASE deny acp the air permit that would destroy the quality of air in Union Hill and the surrounding areas. The acp is NOT needed in Virginia or anywhere. We absolutely need to protect the health of ourselves by protecting the health of our environment. We absolutely need to be looking towards investing in energy infrastructure that does not harm the environment and prevents increased rise in climate temperatures.

Sincerely,
Dianna Sicilia MS LAc
Charlottesville, VA
New Hope, VA



Air Division 1, rr <airdivision1@deq.virginia.gov>

Please Protect the Air

1 message

Dianna <lunar blessings13@gmail.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 11:02 PM

Hi,
My name is Shiva. I am almost twelve years old. Fresh air is really important to me. It is important to me because poisons in the air can be deadly. Please protect the air. Please deny the permit for the Buckingham Co Compressor station.
Sincerely,
Shiva Sicilia
New Hope , VA



1 message

Fri, Sep 21, 2018 at 1:54 PM

David Sligh

<<<<<<<<<<<<<>>>>>>>>>>>>>

--William Faulkner

David Sligh
david@wildvirginia.org
davidwsligh@yahoo.com
434-964-7455

 Comments on Buckingham Compressor Station Air Permit.pdf
115K

David Sligh
1433 Wickham Pond Drive
Charlottesville, Virginia 22901
davidwsligh@yahoo.com
434-964-7455

Virginia Department of Environmental Quality
Piedmont Regional Office, Air Division
4949-A Cox Rd.
Glen Allen, VA 23060
airdivision1@deq.virginia.gov

Submitted Via Email

Re: Buckingham Compressor Station, Draft Air Permit Comments

Dear Sir or Madame:

I urge the State Air Pollution Control Board (Board) to deny the permit for the subject facility. The analysis offered by DEQ to support the draft permit is incomplete, failing to include discussion of factors that the State of Virginia is required to address under Virginia law. Further, certain pollution limits and monitoring requirements in the draft permit fail to provide the levels of protection required under state and federal law.

Failure to Conduct and Document Required Analyses

DEQ officials have stated that the Department and the Board lack authority to consider issues related to the need for the project and proper siting of the station. State law explicitly contradicts this position. The State of Virginia not only has that authority, it has a solemn obligation to exercise it.

The Air Board, in approving permits, “shall consider facts and circumstances relevant to the reasonableness of the activity involved,” including:

1. The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused;
2. The social and economic value of the activity involved;
3. The suitability of the activity to the area in which it is located; and
4. The scientific and economic practicality of reducing or eliminating the discharge resulting from such activity.

Code of Virginia § 10.1-1307.E.

No Need for the Pipeline and Compressor Station

A mountain of evidence proves that Dominion’s claims about the need for gas to be supplied by ACP are untrue. Importantly for this permit review, DEQ has refused to acknowledge this information or to incorporate it into its analysis of Dominion’s application for the air permit.

This deficiency is directly pertinent to the “reasonableness of the activity involved” and the “social and economic value of the activity involved,” which the Air Board must consider. Code of Virginia § 10.1-1307.E. Weighing against the lack of need for the project are the social and economic costs that will be imposed on the communities directly affected by the compressor station.

To find information on the lack of need for the pipeline and compressor station, go to:

- [*Are the Atlantic Coast Pipeline and the Mountain Valley Pipeline Necessary?*](#), Synapse Energy Economics, Inc., September 12, 2016. (“The region’s anticipated natural gas supply on existing and upgraded infrastructure is sufficient to meet maximum natural gas demand from 2017 through 2030. Additional interstate natural gas pipelines, like the Atlantic Coast Pipeline and the Mountain Valley Pipeline, are not needed to keep the lights on.”)
- [*IEEFA Update: Atlantic Coast Pipeline Risk Is Being Borne Not by Dominion and Duke, but by Their Customers*](#), Institute for Energy Economics and Environmental Analysis, September 8, 2017. (“For both Dominion and Duke, Actual Electricity Consumption Has Been Essentially Flat for the Past Few Years, leading the utilities recently to be less optimistic about growth.”)
- [*Natural Gas Industry Admits New Pipelines Aren’t Needed*](#), Natural Resources Defense Council, February 5, 2018. (“a spokesman for Williams, owner of the Transco pipeline, a would-be competitor of ACP, indicated ‘the infrastructure is in place right now to meet the current demand.’”)

Unfair Targeting of Communities of Color and Impacts to Vulnerable Populations

The disproportionate impacts the compressor station would have on the African American community in and around Union Hill are clearly shown. The Federal Energy Regulatory Commission (FERC) relied on incorrect and incomplete information about the local community to dismiss environmental justice and siting concerns. The Air Board must demand that DEQ provide and analyze correct data on these issues and must reject this permit unless and until the Department does so.

The Air Board is required to consider these facts in an analysis of the “character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused” and the “suitability of the activity to the area in which it is located.” Code of Virginia § 10.1-1307.E. The Board must reject the draft permit prepared by DEQ and require that all pertinent siting considerations be investigated and analyzed before it considers the proposal further.

FERC relied on incorrect data from Dominion to conclude in its final environmental impact statement on the ACP that, on average, there are 29.6 people per square mile in the area surrounding the pipeline’s path in Buckingham—that number was provided by the U.S. Census Bureau. However, a survey of the community by Friends of Buckingham showed that FERC’s number was off by about 500 percent.

Even worse, FERC failed to acknowledge the certain impacts to the Union Hill community. As reported in a news article at Cville.com, [Compressor anxiety: Historic African American community alleges environmental racism:](#)

Members of the anti-pipeline group Friends of Buckingham went door-to-door to survey the Union Hill area. They spoke with 64 percent of the people living in the 99 households within that square mile, and of those 158 residents, 85 percent are African American.

The FERC report didn't mention Union Hill, where a third of the residents are descendants of the freedmen community that was once enslaved there, and where there are freedmen cemeteries and unmarked slave burials on the site where Dominion wants to build its compressor station, according to Yogaville resident and cultural anthropologist Lakshmi Fjord.

DEQ has also failed to account for the fact that these areas have unusually large percentages of elderly people and children, both of which are especially sensitive to the kinds of air pollutants the compressor station would emit.

Recently, Governor Northam's Advisory Council on Environmental Justice (ACEJ) found evidence that ACP would have "disproportionate impacts for people of color and for low-income populations due to gas infrastructure expansion." Based on that and other findings, the ACEJ recommended the "Governor direct DEQ to suspend the permitting decision for the air permit for the Buckingham compressor station pending further review of the station's impacts on the health and the quality of life of those living in close proximity." See [ACEJ letter, dated August 16, 2018, at Environmental Justice Review of Virginia's Gas Infrastructure](#). The ACEJ also recommended Governor Northam convene an Emergency Task Force on Environmental Justice in Gas Infrastructure. See article about the ACEJ's action at [Governor's Advisory Council Call for Moratorium on Atlantic Coast and Mountain Valley Pipelines](#), Global Justice Ecology Project, August 29, 2018.

Emission Limits and Monitoring Inadequate to Protect the Public

Limits in the draft permit include limits on nitrogen oxides (NOx) on a time scale that ensures full and adequate protection of the public and compliance with ambient standards. Including only long-term limits, for which average emissions over time are predicted to provide protections is not sufficient. The levels of air pollutants emitted from the compressor station may vary greatly through time, due to changing conditions. Therefore, even if the air quality effects meet protective standards on-average over extended times, harmful levels may exist in the atmosphere for shorter periods. NOx pollution can cause or contribute to detrimental health effects in the short-term (including respiratory problems, especially in people with existing health problems and those with special sensitivities. Only daily limits on emissions can ensure that these kinds of impacts will not result.

Likewise, short-term fluctuations in emissions and levels of impact will not be detected unless monitoring is conducted on a time scale that can detect these changes through time. The permit must include requirements for continuous monitoring to adequately represent levels of emissions.

Conclusion

The draft permit under consideration by the Board cannot adequately protect the public and must be rejected. Unless the required analyses are completed and documented in the supporting information, the permit cannot meet statutory requirements. Also, the limitations and monitoring requirements fail to ensure compliance with standards or adequately protect the public.

Thank you for considering these comments.

Sincerely,
David Sligh



Air Division 1, rr <airdivision1@deq.virginia.gov>

Comments on Buckingham/Union Hill Compressor Station

1 message

Jon Sokolow <jonsokolow1984@gmail.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 2:22 PM

Dear Members of the State Air Pollution Control Board:

As a resident of Fairfax County for the past 25 years and as a practicing attorney for the past 35 years, I urge you to deny the permit requested by the Atlantic Coast Pipeline for a proposed compressor station in Union Hill in Buckingham County.

The board has been presented with voluminous evidence of the adverse health effects that the proposed compressor station would have on the historic, predominantly African American community of Union Hill. Virginia State law clearly prohibits projects that would have a disproportionate impact on communities of color, which is exactly what would occur if this compressor station were to be approved.

I will leave it to others to make the scientific case. I submit these comments to supplement the historical record and to provide context for what you are about to decide.

In 1869, an arsonist burned the Buckingham County Courthouse - an historic building designed by Thomas Jefferson - to the ground. They did so in an attempt to erase the documented history of slavery in the county, including Union Hill. The name of the arsonist remains unknown.

In 2016 and 2017, Dominion Energy and its ACP partners once again tried to erase Union Hill, by falsely claiming that it was not a "cohesive community" and to deny that it was an environmental justice community entitled to protection under federal and state law.

In 2018, the Governor's own Advisory Council on Environmental Justice called on the Governor to halt the permitting process for the Union Hill compressor station. He has yet to respond to that recommendation.

You as citizen members of the Air Pollution Control Board are about to enter the history books, by literally deciding the fate of Union Hill. If you approve this permit, property values will decline, farms will be ruined, health will be impacted, people will get sick and, in a matter of a few short years, the community will be no more than a memory. Approval will thus complete the work the arsonist started in 1869. All that will be left will be the hundreds of burial sites, many unmarked, containing the bodies of slaves who worked the plantation land on which this compressor station would be built - a tobacco plantation known as Variety Shades - as well as the bodies of freedmen who settled the community of Union Hill.

Those graves will scream the story of Union Hill for all eternity.

Those freedmen founded the two historic Baptist churches within one mile of the proposed compressor station - Union Hill Baptist Church and Union Grove Baptist Church. As long as those churches are there - and as long as their prayers are heard - the story of Union Hill will be told.

For all eternity.

You may have the raw power to destroy Union Hill. But know this. **You have no power to control the story that history will forever record.**

Seven generations hence, your descendants will know the names Ralph Northam, Matt Strickler, David Paylor and the names of each member of the State Air Pollution Control Board. Little boys and girls will read about the heroic Virginians who had the courage to try to save an historic community from elimination. Those same little boys and little girls will read about how public officials responded. Did they stand on the side of justice or did they turn their back and roll over to allow a project driven by greed without regard to people, their health or their history?

You get to decide on which side of history you end up.

I urge you to make the right choice in the name of history.

Please incorporate the following articles that I wrote on Union Hill into the record of these proceedings:

<https://bluevirginia.us/2017/07/echoes-dark-past-virginias-standing-rock>

<https://bluevirginia.us/2017/11/dominions-fracked-gas-pipelines-environmental-racism-and-the-appalling-silence-of-the-good-people>

And please search your conscience and do what is right as opposed to what you think is politically expedient.

If you make the right choice, your descendants will sing your praises.

Jonathan Sokolow, Esq.
Reston, Virginia

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Jonathan Sokolow, Esq.*
[1308 Stamford Way](#)
[Reston, Virginia 20194](#)
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*admitted to practice in New York, the District of Columbia and Virginia



Air Division 1, rr <airdivision1@deq.virginia.gov>

Union Hill compressor station

1 message

Margie Spillen <margepill@yahoo.com>

Fri, Sep 21, 2018 at 7:49 PM

To: airdivision1@deq.virginia.gov

- DEQ officials have stated that the Department and the Board lack authority to consider issues related to the need for the project and proper siting of the station. State law explicitly contradicts this position. The State of Virginia not only has that authority, it has a solemn obligation to exercise it.
- The Atlantic Coast Pipeline (ACP) is not needed to supply energy to the areas Dominion claims would be served and
- DEQ has failed to properly consider whether the placement of the facility is appropriate or to acknowledge the violation of environmental justice principles.

What is your response to these issues?

Thank you

Margie Spillen

Sent from my iPhone



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station [SELC comments]

1 message

Charmayne Staloff <cstaloff@selcva.org>

Fri, Sep 21, 2018 at 7:35 PM

To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>

Dear Mr. Dowd, Chairman Langford, and Members of the Air Pollution Control Board,

The Southern Environmental Law Center submits the attached comments on the draft air permit for the proposed Buckingham County compressor station to the Department of Environmental Quality. SELC submits these comments on behalf of the organizations listed in the comments.

Thank you for the opportunity to comment on the draft permit.

Sincerely,

Charmayne G. Staloff

Associate Attorney

Southern Environmental Law Center

201 West Main St., Ste. 14

Charlottesville, VA 22902-5065

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This e-mail may contain confidential or privileged information. If you are not the intended recipient, please delete this email and all attachments without reading or forwarding to others, and notify the sender immediately by return e-mail.

2 attachments**Buckingham Compressor Station Air Permit Comments SELC Attachments 1-4.pdf**

3172K

**Buckingham Compressor Station Air Permit Comments SELC.pdf**

898K

SOUTHERN ENVIRONMENTAL LAW CENTER

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Facsimile 434-977-1483

September 21, 2018

Submitted via email:

Mr. Michael Dowd
Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Road
Glen Allen, Virginia 23060
airdivision1@deq.virginia.gov

Chairman Richard D. Langford and Members of the Air Pollution Control Board
c/o Office of Regulatory Affairs
Department of Environmental Quality
P.O. Box 1105
Richmond, Virginia 23218

RE: Buckingham Compressor Station, Registration No. 21599

To Mr. Dowd, Chairman Langford, and Members of the Air Pollution Control Board:

The Southern Environmental Law Center offers the following comments on the draft air permit for the Atlantic Coast Pipeline, LLC's ("Atlantic") proposed Buckingham Compressor Station, Registration Number 21599 ("Draft Permit"). These comments are submitted on behalf of the Southern Environmental Law Center, Friends of Buckingham, Natural Resources Defense Council, Sierra Club, Shenandoah Riverkeeper, Potomac Riverkeeper, Shenandoah Valley Battlefields Foundation, Virginia Wilderness Committee, Augusta County Alliance, Shenandoah Valley Network, Highlanders for Responsible Development, the Chesapeake Climate Action Network, Wild Virginia, the Allegheny-Blue Ridge Alliance, and Defenders of Wildlife.

The proposed Buckingham Compressor Station is one of three that would provide compression of natural gas along the proposed 600-mile Atlantic Coast Pipeline ("ACP"), a project primarily owned by Dominion Energy and Duke Energy. The facility would be the only compressor station in Virginia and would be sited in a predominantly African-American community. The compressor station threatens to harm public health in that community and to violate the Clean Air Act. Because of significant errors in the Draft Permit, unanswered

questions about risks to human health, greenhouse gas pollution that threatens to undermine Virginia's proposed new carbon regulations, and unaddressed environmental justice concerns, these public-interest organizations respectfully request that the Virginia Department of Environmental Quality ("VDEQ") withdraw this Draft Permit, complete a thorough environmental justice and health assessment of the community that would be subject to the air pollution from this facility, and conduct additional analysis as described in more detail below. In the event that the Draft Permit is submitted to the Air Pollution Control Board, we ask that the Board reject approval of the Draft Permit.

This comment letter is in two parts and will address the following issues:

The Buckingham Compressor Station Would be a Major New Source of Greenhouse Gas Pollution and is Unsuitably Sited in an Environmental Justice Community:

- As a major source of greenhouse gas emissions, the Buckingham Compressor Station should be subject to greater scrutiny from VDEQ; and
- Pollution from the Buckingham Compressor Station threatens the health of the historic, predominantly African-American community of Union Hill and requires additional study, consistent with the recommendations of the Virginia Advisory Committee on Environmental Justice.

Technical Comments on Deficiencies in the Draft Permit:

- The best available control technology ("BACT") analysis relied on by VDEQ is inadequate because it failed to consider the "maximum degree" of Nitrogen Oxide emissions reduction;
- VDEQ did not consider electric motor compressor turbines in its BACT analysis;
- VDEQ should require continuous emission monitoring systems for Nitrogen Oxide emissions from the four compressor turbines;
- VDEQ should require BACT for fugitive emissions;
- The National Ambient Air Quality Standard (NAAQS) Modeling Analyses for the Buckingham Compressor Station contains significant flaws; and
- Atlantic has not adequately demonstrated that the Buckingham Compressor Station will not cause or contribute to any concentration that may exceed a significant ambient air concentration for air toxics

I. The Buckingham Compressor Station Would be a Major New Source of Greenhouse Gas Pollution and is Unsuitably Sited in an Environmental Justice Community.

A. ACP and Buckingham Compressor Station Would Be a Major New Source of Greenhouse Gas Emissions.

Before addressing particular technical concerns with the draft air pollution permit for the proposed Buckingham Compressor Station, the public-interest groups lodge their objections to the climate impacts that would be brought by the ACP and its compressor station in Virginia.

According to the Atlantic permit application¹, the facility-wide potential greenhouse gas (“GHG”) emissions include 291,812 tons per year of carbon dioxide (“CO₂”), 70.9 tons per year of methane (which is roughly 30 times more potent as a greenhouse gas than CO₂²), and 7.05 tons per year of nitrous oxide (which is roughly 300 times more potent as a greenhouse gas than CO₂³). Atlantic identifies the facility-wide potential CO₂ equivalent emissions of the Buckingham Compressor Station as 295,686 tons per year.⁴ In comparison, a new major stationary source with a potential to emit greenhouse gas emissions in excess of 75,000 tons per year would be subject to major source permitting requirements under the prevention of significant deterioration (“PSD”) permitting program if such source was also a major source for a regulated new source review pollutant that is not a greenhouse gas pollutant.⁵

Atlantic has indicated the Buckingham Compressor Station will have a potential to emit greenhouse gases of almost four times the PSD emissions threshold for subjecting a source to PSD requirements. Nevertheless, the projected greenhouse gas emissions from the Buckingham Compressor Station are not subject to *any* air permitting requirements because the facility is being permitted as a minor source for all non-greenhouse gas regulated new source review (“NSR”) pollutants.⁶ If the Buckingham Compressor Station was subject to relevant PSD requirements, these would include the application of best available control technology

¹ See May 25, 2018 New Source Permit Application for Buckingham Compressor Station at 17 (Table 3.9).

² See <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>.

³ *Id.*

⁴ Considering the downstream carbon-equivalent emissions of the ACP as a whole puts this issue in even starker relief. The Federal Energy Regulatory Commission estimated that the downstream carbon emissions from combusting the gas that will flow through the ACP to equal 29,028,450 tons per year of CO₂-equivalent emissions.

⁵ See, e.g., 40 C.F.R. §52.21(b)(49)(iv)(a).

⁶ See VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599 at 1, note 1, and at Section IV.B.

(“BACT”). VDEQ needs to address this regulatory loophole that allows such new significant unregulated GHG pollution.

Given that the Commonwealth of Virginia has become a member of the Under2 Coalition, committing to support the Paris Climate Agreement’s goal of keeping global warming below two degrees Celsius,⁷ it is imperative that Virginia address how allowing the construction and operation of the Buckingham Compressor Station and its potential 295,686 tons of CO2 equivalent emissions per year is consistent with the Commonwealth’s climate change commitments. Indeed, allowing an additional 295,686 tons per year of CO2 equivalent emissions with the Buckingham Compressor Station will frustrate the Commonwealth’s proposed plans to reduce CO2 emissions from the electric sector. Specifically, Virginia recently released a draft regulation to impose statewide CO2 emission caps on the electric sector to reduce carbon emissions by 30% between 2020 and 2030.⁸ While the Commonwealth has proposed a couple of different options, the draft plan would be to reduce CO2 emissions from the electric sector statewide by approximately one million tons per year.⁹ Yet, concurrently, VDEQ is proposing to allow the construction and operation of the Buckingham Compressor Station, which would negate a little less than one-third (i.e., about 296,000 tons of CO2 emissions) of those planned CO2 emissions reductions per year. While we strongly support the Commonwealth’s membership in the Under2 Coalition and its commitment to do its part to reduce climate-changing emissions from the electric sector, Virginia also needs to address other sources of climate changing emissions, especially a source like the Buckingham Compressor Station that will frustrate the state’s attempt to reduce statewide CO2 emissions.

As part of its review of the Draft Permit, the Air Pollution Control Board shall consider “facts and circumstances relevant to the reasonableness of the activity involved...including...(2) [t]he social and economic value of the activity involved.”¹⁰ This statutory mandate includes not only a consideration of the GHG emissions from the Buckingham Compressor Station, but also the lack of demonstrated need for the ACP as a whole. This massive, \$6.5 billion project is

⁷ As discussed at <https://www.climateweeknyc.org/virginia-becomes-latest-us-state-commit-action-climate-change>.

⁸ *Id.*

⁹ As indicated in the declining base emission budgets of draft rule 9VAC5-140-6190, in the January 8, 2018 Virginia Register of Regulations available at <http://register.dls.virginia.gov/details.aspx?id=6770>.

¹⁰ Va. Code Ann. § 10.1-1307(E).

owned by a conglomeration of energy companies, including Dominion Energy.¹¹ Affiliates of those same companies have contracts to purchase nearly all of the gas from the ACP, which, according to Atlantic's FERC filings, will be used to generate electricity for monopolized markets in Virginia and North Carolina.¹² At the end of the day, Dominion will seek to recover its costs, along with a 14% return on equity,¹³ from its captive ratepayers in the Commonwealth.¹⁴ Our Virginia members will be stuck with the bill even if this proves to be a stranded asset. Demand for electricity has been flat or declining for the last decade.¹⁵ The need for more natural gas for power generation in this region is not expected to increase through 2030. The capacity of existing pipeline and storage infrastructure is more than sufficient to meet demand for natural gas through that time.¹⁶ In the last several months, Dominion has announced that it does not plan to build any new gas-fired power plants.¹⁷ At the same time, non-polluting efficiency measures and renewable energy technologies are increasingly proving capable to meeting our energy needs for less money than fossil-fuel resources.¹⁸

Our overarching concern regarding the lack of need for this project is relevant to the Draft Permit for the Buckingham Compressor Station and the decision of the Air Pollution Control Board. As noted above, the ACP and Buckingham compressor station will be a major

¹¹ Robert Walton, *Atlantic Coast Pipeline Price Tag Could Teach \$6.5B, Says Duke CEO*, Utility Dive (Aug. 22, 2018), <https://www.utilitydive.com/news/atlantic-coast-pipeline-pricetag-could-reach-65b-says-duke-ceo/517661/>.

¹² According to Atlantic's application, 79% of the pipeline's capacity will supply power plants. ACP Application for CPCN at 6-8, 12 (Sept. 18, 2015) (FERC eLibrary No. 20150918-5212).

¹³ Atlantic Coast Pipeline, LLC, 161 FERC ¶ 61,042 at P 102-104 (Oct. 13, 2017).

¹⁴ *Id.* at P 60. FERC authorizes Atlantic to recover a certain rate of return—the “recourse rate.” Atlantic will then pass on the costs of that recourse rate to its shippers, who in turn pass on the cost to the end users. Because the end user is a regulated utility, the public utility's ratepayers bear the increases in gas prices attributable to the recourse rate. When, as here, the regulated utility's parent company also owns the pipeline, the utility has a vested interest in buying gas shipped on its pipeline, even if adequate, lower-cost gas is available from a pre-existing, and lower-cost, source. Thus, captive ratepayers are at risk of inflated prices from this massive project.

¹⁵ See James F. Wilson, Wilson Energy Economics, *Evaluating Market Need for the Atlantic Coast Pipeline* (2017).

¹⁶ See Rachel Wilson et al., Synapse Energy Economics, *Are the Atlantic Coast Pipeline and the Mountain Valley Pipeline Necessary? An Examination of the Need for Additional Pipeline Capacity into Virginia and the Carolinas* (2016), https://www.southernenvironment.org/uploads/words_docs/2016_09_12_Synapse_Report_-_Are_the_ACP_and_MVP_Necessary__FINAL.PDF.

¹⁷ Alwyn Scott, *General Electric's power unit fights for growth as wind, solar gain* Reuters (May 24, 2018), <https://www.reuters.com/article/us-ge-renewables/general-electrics-power-unit-fights-for-growth-as-wind-solar-gain-idUSKCN1IP0LE>.

¹⁸ See Matt Cox, Ph.D., Greenlink, *Clean Energy Has Arrived: Tapping Regional Resources to Avoid Locking In Higher Cost Natural Gas Alternatives in the Southeast* (April 2017).

new source of methane emissions—an extremely potent greenhouse gas—as well as on-site and downstream carbon emissions. These new sources of greenhouse gas pollution threaten to undermine Virginia’s proposed new carbon regulations, which are designed to reduce Virginia’s role in exacerbating climate change. Permitting this major new source of greenhouse gas emissions also runs counter to the Governor’s commitment to the Paris Climate Accords. Given the concerns that the primary purpose of the ACP and its attendant Buckingham compressor station is to enrich shareholders of utility holding companies and that the project is not necessary for meeting the energy needs of the Commonwealth, the Board can conclude that there is little social or economic value in the proposed activity.

B. Pollution from the Buckingham Compressor Station Threatens the Health of the Predominantly African-American Surrounding Community and Requires Additional Scrutiny Regarding Site Suitability.

Atlantic has decided to place the sole Virginia compressor station—a 68-acre industrial facility—in the populated Union Hill community in Buckingham County. As set forth in more detail below, an exhaustive, rigorous, door-to-door study conducted by Friends of Buckingham of those who live within a 1.1-mile radius from the proposed gas-fired compressor station reveal that the harmful effects of the compressor station will be most felt in a predominantly African-American community. This community-based qualitative research study of 99 households encompassed the culturally cohesive community of Union Hill. The study design and methods included using National Institutes of Health (NIH) protocols for confidentiality.¹⁹

As required by law, VDEQ’s engineering analysis included a section on “site suitability.” This analysis is supposed to include an evaluation of the “suitability of the activity to the area in which it is located.”²⁰ But VDEQ did not comply with the requirements of Virginia law to consider the suitability of placing this industrial source of pollution in the Union Hill

¹⁹ The study was designed by a Lakshmi Fjord, Ph.D. The study included open-ended interview questions about: existing, diagnosed health conditions and numbers of household residents on weekdays or otherwise; the study also included questions about: race; age ranges (to protect anonymity of health data); present uses of land, including whether it is used to grow food, raise domestic animals, or grow timber or other agricultural uses; family history in this place based on family burials in nearby cemeteries; and, slave and freedmen history based on location of unmarked slave burials; existing Freedmen-era home-places or foundation sites, if no longer standing. Study data as of September 4, 2018 includes 75 households that were reached over two years in three one-month long intensive periods. 67 of the respondents were able to cover the full list of questions.

²⁰ *Id.*

community. The disproportionate risk of harm faced by the predominantly African-American community that lives within a mile of the proposed compressor station has not been considered.

The survey conducted by Friends of Buckingham identified nearly 100 households in the 1.1-mile radius of the proposed compressor stations.²¹ The 75 households surveyed to date are made up of 199 residents (with additional residents on weekends and for family gatherings, including reunions). Racial and ethnic minorities make up 83 percent of those residents, a far higher percentage than in the Commonwealth as a whole.²² A significant number of respondents provided information about their health. Many elderly residents reported suffering from chronic respiratory ailments such as asthma, chronic obstructive pulmonary disease, bronchitis, allergies, and other unspecified heart and lung ailments. In addition, many of these residents report high blood pressure, heart disease, diabetes, and other ailments that would make them particularly susceptible to pollution and fugitive emissions from the compressor station. A number of children were reported to suffer from asthma and other chronic lung diseases as well.

Multiple studies have found that African Americans are more than twice as likely as white Americans to live near sources of harmful air pollution and have suffered disproportionate respiratory sickness as a result.²³ Putting the compressor station in this predominately African American community will further this legacy of concentrating environmental harms in poorer communities and communities of color.

A key step of Environmental Justice review includes identifying vulnerable populations who are at risk of disproportionate and cumulative harm from polluting facilities.²⁴ The high

²¹ Union Hill Community Household Study Results, Friends of Buckingham, Lakshmi Fjord, Ph.D., **included as Attachment 1.**

²² United States Census, Virginia Quick Facts (nearly 70% of Virginians identify as white, in contrast to the 16.6% of survey respondents who identified as white), <https://www.census.gov/quickfacts/va>.

²³ Gamble, J.L., et al, *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. Ch. 9: Populations of Concern, U.S. Global Change Research Program, Washington, DC (2016). <http://dx.doi.org/10.7930/J0Q81B0T> (citing Frumkin, *Urban sprawl and public health*. Public Health Reports, pp. 117, 201-217 (2002)); Robert Bullard, et al, *Toxic Wastes and Race at Twenty: Why Race Still Matters After all of These Years*, 38 Environmental Law 371, 379 (2007) (citing David Pace, *More Blacks Live with Pollution*, Associated Press (2005) (noting that most pollution inequities result from historical land use decisions that were based on racial segregation and the prevalence of regulators focusing on one plant or one pollutant without regard to the potential cumulative impact of multiple sources of pollutants).

²⁴ See, e.g., *Promising Practices for EJ Methodologies in NEPA Reviews: Report of the Federal Interagency Working Group on Environmental Justice & NEPA Committee*, Identifying Minority Populations, at 21 (Mar. 2016), https://www.epa.gov/sites/production/files/2016-08/documents/nepa_promising_practices_document_2016.pdf.

levels of diagnosed respiratory ailments and related health issues will make many in the Union Hill community especially susceptible to harm from increased air pollution and is one of the reasons why community members have specifically requested a health assessment before moving forward with the permitting process.

Pollution from the Buckingham facility could lead to adverse health effects to the surrounding population even under the limits set by the Draft Permit. In its Environmental Impact Statement for the ACP, the Federal Energy Regulatory Commission (“FERC”) recognized the health risks from pollution from the ACP’s compressor stations, which:

include carbon monoxide (CO), carbon dioxide (CO₂), methane, and nitrous oxide (NO_x); volatile organic compounds (VOCs); and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns (PM_{2.5}). These air pollutants are known to increase the effects of asthma and may increase the risk of lung cancer....

When considering the health impacts associated with compressor station emissions, increased rates of lung cancer were identified associated with the compounds emitted by compressor station operations. Studies have shown that several different cancer-related compounds and chemicals are present in the air in proximity to construction and operation of compressor stations, and that some of these have documented health effects on the general and vulnerable populations.²⁵

The studies cited by FERC found elevated concentrations of dangerous pollutants from samples collected near compressor stations. These include volatile organic compounds (“VOCs”), fine particulate matter, and gaseous radon. Some VOCs, such as benzene and formaldehyde, are carcinogens.

According to a recent report from Physicians for Social Responsibility, a “growing body of scientific evidence documents leaks of methane, toxic volatile organic compounds and particulate matter throughout [our country’s natural gas] infrastructure. These substances affect [human] health.”²⁶ People living near compressor stations suffer from a “range of symptoms

²⁵ Atlantic Coast Pipeline, Final Environmental Impact Statement, at 4-513 to 514.

²⁶ *Too Dirty Too Dangerous: Why Health Professionals Reject Natural Gas*, Physicians for Social Responsibility (Feb. 2017), <http://www.psr.org/assets/pdfs/too-dirty-too-dangerous.pdf> [“Too Dirty Too Dangerous”]. This report compiled new scientific studies that indicate additional potential pollution from natural gas infrastructure, including compressor stations.

ranging from skin rashes to gastrointestinal, respiratory, neurological and psychological problems.”²⁷ Air samples collected around compressor stations have revealed elevated concentrations of many of the dangerous substances associated with gas extracted from hydraulic fracturing operations. These dangerous substances include “volatile organic compounds, particulate matter, and gaseous radon.”²⁸ The federal Agency for Toxic Substances and Disease Registry examined air quality near a natural gas compressor station in Pennsylvania and discovered PM_{2.5} at dangerous levels.²⁹ Just last year, the NAACP, in cooperation with the Clean Air Task Force, released a report about the threats to the health of communities of color from oil and gas infrastructure, including the proposed Atlantic Coast Pipeline and compressor stations.³⁰

The company’s reported “annual potential to emit” in terms of tons of pollutants per year does not reflect the variability of emissions and thus, the potential for local residents to be exposed to elevated concentrations of dangerous pollutants. Emissions over short time periods can vary significantly day to day. Operating compressor stations have been observed to have such highly variable emissions, including large spikes of harmful VOC emissions.³¹ One compressor station in Pennsylvania emitted dangerous amounts of ethylbenzene, butane, and benzene on some days and hardly detectable amounts on other days, resulting in averages that did not appropriately indicate the compressor station’s threats to human health.³²

²⁷ *Id.* (citing Brown, Weinberger, & Weinberger, *Human exposure to unconventional natural gas development: A public health demonstration of periodic high exposure to chemical mixtures in ambient air*, *Journal of Environmental Science and Health, Part A*, 50:5, 460-472 (2015), <https://www.ncbi.nlm.nih.gov/pubmed/25734822>).

²⁸ New York State Department of Health (2014). A public health review of high volume hydraulic fracturing for shale gas development. http://www.health.ny.gov/press/reports/docs/high_volume_hydraulic_fracturing.pdf.

²⁹ *Id.* (citing Agency for Toxic Substances and Disease Registry, *Health Consultation: Exposure Investigation, Natural Gas Ambient Air Quality Monitoring Initiative Brigich Compressor Station, Chartiers Township, Washington County, Pennsylvania* (Jan. 29, 2016); Agency for Toxic Substances and Disease Registry, *Health Consultation: Brooklyn Township PM_{2.5}, Brooklyn Township, Susquehanna County, Pennsylvania*. U.S. Department of Health and Human Services, Atlanta, GA. (April 22, 2016).

³⁰ Lesley Fleischman (Clean Air Task Force) & Marcus Franklin (NAACP), *Fumes Across the Fence-Line: The Health Impacts of Air Pollution from Oil & Gas Facilities on African American Communities*, p. 7 (Nov. 2017), http://www.naacp.org/wp-content/uploads/2017/11/Fumes-Across-the-Fence-Line_NAACP_CATF.pdf.

³¹ Southeast Pennsylvania Health Project, *Summary on Compressor Stations and Health Impacts* (Feb. 24, 2015), <http://www.environmentalhealthproject.org/files/Summary%20Compressor-station-emissions-and-health-impacts-02.24.2015.pdf>.

³² *Id.* at 2.

Communities that are nearby or downwind from compressor stations likely suffer from elevated exposure to methane and related pollutants. This was the conclusion of a recently published analysis of methane emissions from compressor stations in New York and Pennsylvania, which found highly elevated levels of methane coming from those facilities.³³ In one example, the study authors found:

This data indicates that the areas downwind of compressor stations ...will be exposed to methane plumes, and any other co-emitted pollutants released by compressor stations. Residents and properties downwind under prevailing wind conditions will likely be subjected to a disproportionate burden of contaminants from compressor stations, especially those closer to the station under light prevailing wind conditions.³⁴

The Air Board should also consider that, even if the new emissions of pollutants such as fine particulate matter (PM_{2.5}) and other ozone-producing pollutants, such as Nitrogen Dioxide, are within NAAQS guidelines, there is no scientifically accepted safe level of exposure for this pollution. In addition, the increases over the background levels are significant. For example, the permitted annual increase in PM_{2.5} pollution from the Buckingham Compressor Station over the background level is 44 percent.³⁵ The resulting increased pollution approaches the World Health Organization's threshold of 25 µg/m³ in a twenty-four hour period.³⁶ At these levels, long-term exposure can cause an increase in mortality and increased serious health problems, such as respiratory ailments and cardiovascular disease.³⁷ Even short-term exposure can cause health problems, particularly in sensitive populations like those with respiratory problems or heart disease—like many of those who live near the proposed compressor station.³⁸

³³ Bryce Payne, Jr., et al, *Characterization of methane plumes downwind of natural gas compressor stations in Pennsylvania and New York*, Science of the Total Environment, Vol. 580, pp. 1214–1221 (Feb. 2017).

³⁴ *Id.*

³⁵ see VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 12.

³⁶ World Health Organization, Fact sheet: Ambient (outdoor) air quality and health (Sept. 2016), <http://www.who.int/mediacentre/factsheets/fs313/en/> (“WHO Fact Sheet”) (“There is a close, quantitative relationship between exposure to high concentrations of small particulates (PM₁₀ and PM_{2.5}) and increased mortality or morbidity, both daily and over time”).

³⁷ Frank J. Kelly and Julia C. Fussell, *Air Pollution and Public Health: Emerging Hazards and Improved Understanding of Risk*, Environ Geochem Health, Vol. 37(4) 631–649 (2015), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4516868/>.

³⁸ *Id.*

Fine particles also cause health problems such as heart attacks, aggravated asthma, decreased lung function, and irregular heartbeats.³⁹ Exposure to fine particle concentrations as low as ten micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)—which is lower than the current federal standard—is associated with a two percent increase in premature deaths for exposures as brief as two days, and a seven to nine percent increase in the long term.⁴⁰ Decreases in fine particle concentrations add months, if not years, onto people’s lives.⁴¹

There is no evidence of a safe level of exposure for either ozone or fine particulate matter, and both have health effects even below the current National Ambient Air Quality Standards (NAAQS).⁴² In response to evidence of health problems caused by these pollutants at lower and lower levels, EPA has repeatedly strengthened both the fine-particle and ozone NAAQS in recent years.⁴³

As the Air Board considers the site suitability and environmental justice issues set forth in more detail below, it should consider the significant overall increases to local air pollution from this facility.

1. Virginia Advisory Committee on Environmental Justice Calls for Suspending Permit.

In 2017, the Governor of Virginia issued Executive Order Number 73, establishing an Advisory Committee on Environmental Justice.⁴⁴ This order sought to ensure that “no segment

³⁹ See generally EPA, *Particulate Matter (PM) Health*, <https://www3.epa.gov/pm/health.html>.

⁴⁰ Liuhua Shi et al., *Low-Concentration PM_{2.5} and Mortality: Estimating Acute and Chronic Effects in a Population-Based Study*, *Envtl. Health Persp.* (Jan. 2016), <http://ehp.niehs.nih.gov/1409111/>.

⁴¹ See C. Arden Pope III et al., *Fine-Particulate Air Pollution and Life Expectancy in the United States*, 360(4) *New Eng. J. Med.* 2009 376, 382–84 (Jan. 22, 2009), <http://www.nejm.org/doi/pdf/10.1056/NEJMs0805646>.

⁴² See *Am. Trucking Ass’n., Inc. v. EPA*, 283 F.3d 355, 360 (D.C. Cir. 2002) (internal quotation marks and alterations omitted) (recognizing the “lack of a threshold concentration below which [particulate matter and ozone] are known to be harmless.”); EPA, *NAAQS for Particulate Matter*, 78 Fed. Reg. 3086, 3098 (Jan. 15, 2013) (explaining that there is “no population threshold, below which it can be concluded with confidence that PM_{2.5} related effects do not occur”).

⁴³ See National Ambient Air Quality Standards for Particulate Matter, 78 Fed. Reg. 3086, 3088 (Jan. 15, 2013); National Ambient Air Quality Standards for Ozone, 80 Fed. Reg. 65,291, 65,292 (Oct. 26, 2015) <https://www.gpo.gov/fdsys/pkg/FR-2015-10-26/pdf/2015-26594.pdf>; Environmental Protection Agency, *NAAQS Table*, <https://www.epa.gov/criteria-air-pollutants/naaqs-table#3>.

⁴⁴ Commonwealth of Virginia, Office of the Governor, Executive Order 73, Establishment of an Advisory Council on Environmental Justice (Oct. 31, 2017), <https://www.naturalresources.virginia.gov/media/governorvirginiagov/secretary-of-natural-resources/pdf/eo-73-establishment-of-an-advisory-council-on-environmental-justice.pdf>.

of the population, especially individuals most impacted and vulnerable,” would “bear disproportionately high or adverse effects from pollution.” To that end, the Governor sought the help of the Advisory Council to incorporate environmental justice into Executive Branch agency decision-making. The Governor noted that “some state agencies incorporate environmental justice into their review process,” but that there is no consistency in how these issues are considered. It appears that DEQ has not yet instituted a consistent method for incorporating environmental justice issues in its permitting process.

The Advisory Committee on Environmental Justice has itself, however, examined the concerns surrounding the ACP and proposed compressor station in the Union Hill community.⁴⁵ Following its review, the Advisory Committee called on the Governor to request that DEQ “suspend the permitting decision for the air permit for the Buckingham compressor station pending further review of the station’s impacts on the health and the lives of those living in close proximity.”⁴⁶ The Advisory Committee considered many independent and mutually reinforcing concerns with siting the compressor station in the Union Hill community, for example concerns with: (1) the use and abuse of eminent domain to take private property for a project that is not in the public interest along with the threats to property values of surrounding properties; (2) the significant levels of harmful pollution that will be emitted by the compressor station and the disproportionate impact of that pollution on a predominantly (roughly 85%) African-American community; (3) disturbing cultural and archeological sites of importance to Native-American tribes and African-American communities; (4) the inadequate 401 Clean Water Act certification for the many stream and wetland crossings; and (5) the significant climate impacts from the compressor station and the ACP generally, particularly in light of the failure by ACP-Dominion to demonstrate market need for the project.

The Advisory Committee noted that “decisions for infrastructure with significant social and ecological risks, like compressor stations, should not be made hastily, particularly in places

⁴⁵ See *Environmental Justice Review of Virginia’s Gas Infrastructure*, Memo to Governor Northam (Aug. 16, 2018), **included as Attachment 2.**

⁴⁶ *Id.* at 2.

like Union Hill where the everyday experiences of residents are shaped by historical experience of racial injustice for a population whose ancestry is rooted in slavery.”⁴⁷

The Advisory Committee’s recommendations are consistent with the public policy of Virginia. Virginia law requires that the Commonwealth develop “energy resources and facilities in a manner that does not impose a disproportionate adverse impact on economically disadvantaged or minority communities.”⁴⁸ No Virginia agency has, to our knowledge, yet applied this standard to the ACP’s proposed, new energy infrastructure.

VDEQ and the Air Pollution Control Board should consider the Advisory Committee’s recommendations in light of the obligation to consider site suitability.

2. Unlawful Zoning Determination by Buckingham Board of Supervisors

As an additional part of its site suitability analysis, VDEQ noted that the Buckingham County Board of Supervisors approved a Special Use Permit for the compressor station and concluded that the “ACP must operate in compliance with the County’s approval as well as any other ordinances or regulations related to land use.”⁴⁹ VDEQ failed to note, however, that the Board of Supervisors’ zoning decision is the subject of ongoing litigation.⁵⁰ The land where Atlantic plans to build the Buckingham Compressor Station is zoned A-1 Agricultural. Many in the community continue to use their land for agricultural purposes, such as farming, orchards, and livestock. Pollution from the compressor station is not compatible with those activities and is not suitable to the area where it would be located.⁵¹ Union Hill’s unbroken history as an agricultural district is threatened by the proposed compressor station.

A-1 Agricultural Zones were established “for the purpose of preserving and promoting rural land uses.”⁵² The A-1 district of the Buckingham County Zoning Ordinance is an inclusive zoning district, which means that the Ordinance only permits land uses that are “specifically

⁴⁷ *Id.* at 5.

⁴⁸ Va. Code Ann. § 67-101(12).

⁴⁹ See VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 13.

⁵⁰ See, e.g., *Arostegui v. Buckingham County Board of Supervisors*, CL17000015-00 (Feb. 2, 2017); a companion case challenging the zoning determination was filed in the Supreme Court of Virginia in the summer of 2018. *Blue Ridge Environmental Defense League et al v. Buckingham County Board of Supervisors*, Supreme Court of Virginia SCV No. 180933 (2018).

⁵¹ Va. Code Ann. § 10.1-1307(E).

⁵² Buckingham County Zoning Ordinance at 9.

named.”⁵³ Land uses that are not listed are not permitted even with a special use permit. The Buckingham Board of Supervisors established the M-2 Heavy Industrial District for industrial uses, including gas distribution facilities (which require a special use permit).⁵⁴ Under the A-1 Agricultural designation, industrial facilities like the compressor station are completely prohibited. As challenged by many local residents, the Board of Supervisors erred when they used a “public utility” exception for the compressor station, which is not a utility as defined by applicable law.⁵⁵ Atlantic itself indicated that the Compressor Station is a non-utility facility.⁵⁶

VDEQ therefore erred when it concluded that the compressor station can be located at its proposed location in compliance with existing local ordinances related to land use. The Air Board should, at a minimum, postpone any action until litigation is complete for purposes of determining site suitability in relation to local zoning requirements.

3. Union Hill is More Densely Populated than the County Average.

As part of its site suitability analysis, VDEQ determined that the area around the proposed Buckingham Compressor Station is “sparsely populated” and primarily surrounded by forests.⁵⁷ This conclusion is not consistent with the denser than average Union Hill community that inhabits the area within a one-mile radius of the site. To reach this flawed conclusion, it appears that VDEQ relied on Atlantic’s use of countywide population density data of 29.6 people per square mile.⁵⁸ But this county-level population density data does not reflect the actual characteristics of the neighboring community. As noted above, Friends of Buckingham has identified nearly 100 households in the 1.1 mile radius of the proposed compressor stations. The 75 households surveyed to date are made up of 199 residents.

As seen in Figure 1 below, there are significant clusters of households in the area surrounding the proposed compressor station:

⁵³ See *Board of Supervisors of Madison County v. Gajjhey*, 244 Va. 545, 550, 422 S.E. 2d 760, 763 (1992).

⁵⁴ Buckingham County Zoning Ordinance at 35.

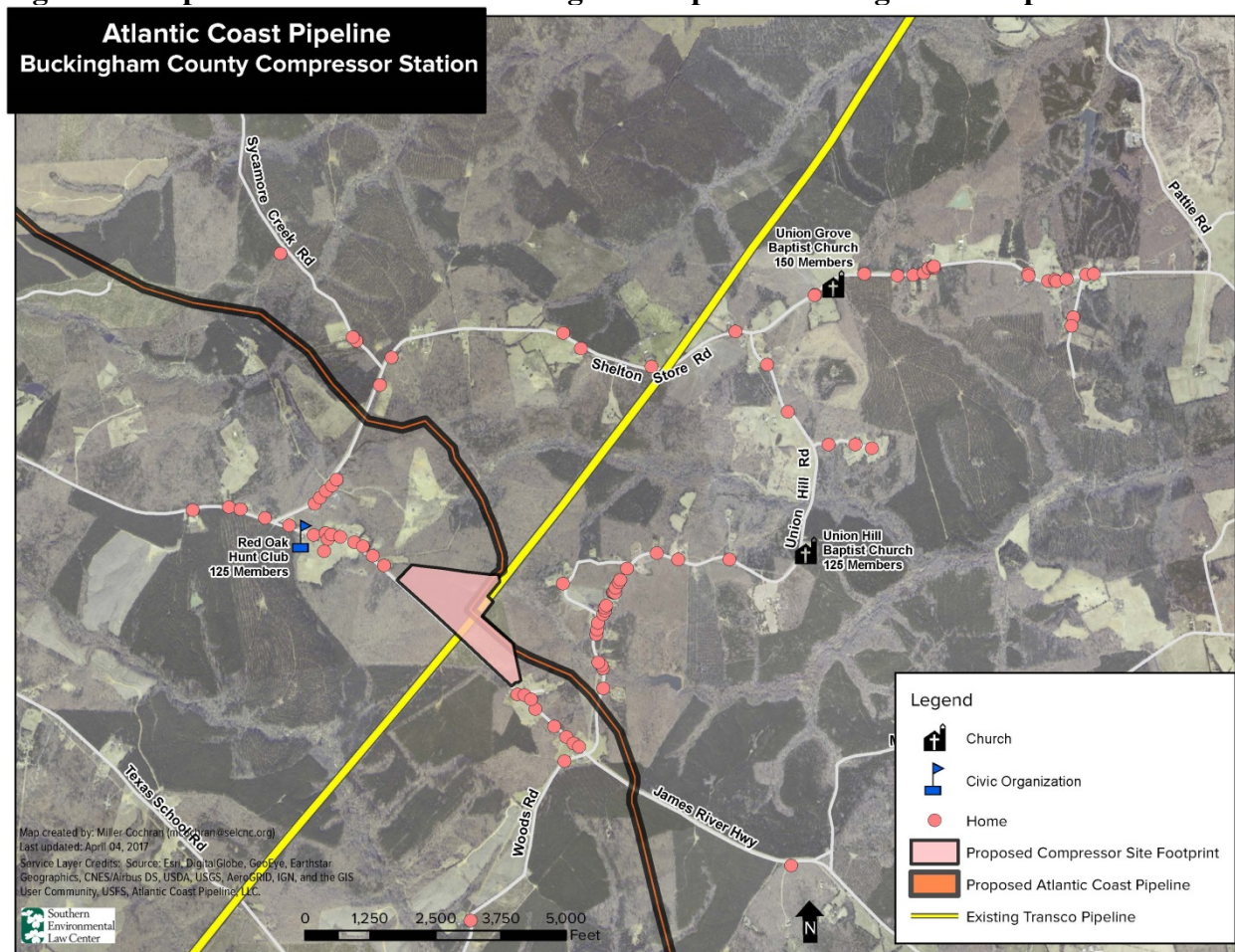
⁵⁵ VA Code § 56-265.1

⁵⁶ Updated Permit Application at p. 23 (May 25, 2018).

⁵⁷ see VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 13

⁵⁸ Final Environmental Impact Statement for the Atlantic Coast Pipeline and Supply Header Project under FERC Docket No. CP-15-554 et al. (July 21, 2017) (eLibrary No. 20170721-4000) at p. 4-485.

Figure 1: Map of Households Surrounding the Proposed Buckingham Compressor Station



This disparity is significant, and the large number of households that in fact lie close to the proposed compressor station contradict VDEQ’s site suitability conclusion that the area around the Buckingham compressor station is primarily surrounded by forests and sparsely populated. The Air Board must independently consider the unsuitability of this proposed location for a new source of industrial air pollution.

4. Endangered Historic Place

Preservation Virginia listed the Union Hill community as a “Most Endangered Historic Place” in May 2016.⁵⁹ Many of the African American members of this community trace their heritage back to the Freedmen who settled this area following emancipation after the Civil War. Preservation Virginia noted the importance of “[p]ost-Emancipation African American

⁵⁹ Preservation Virginia, *2016 Virginia’s Most Endangered Historic Places* (May 2016), https://preservationvirginia.org/press_release/2016-virginias-most-endangered-historic-places/.

settlements and burial sites, like those at Union Hill in Buckingham County,” which “reveal the successes and struggles of generations of African Americans in Virginia.”⁶⁰ Many of the landowners in closest proximity to the proposed compressor station are descendants of people enslaved here, where once the number of slaves was twice that of whites. The compressor station itself is slated to be built on the property of a former plantation called Variety Shade.⁶¹

The communities built by freed slaves before and after Emancipation and during Reconstruction, post-Reconstruction, and the era of Jim Crow segregation that followed contain important cultural resources. Racial segregation and discrimination have resulted in the undervaluing of these historic communities throughout the south. Loss of buildings on the ground by fire, discriminatory historic recording practices, and loss of burial sites and cemeteries by development all contribute to the need to protect and preserve what remains of communities that were founded by Freedmen following the Civil War. In the case of Union Hill, its unbroken history as an agricultural district is particularly threatened by Atlantic’s proposed compressor station.

Historic structures established following Emancipation by African-Americans in the Union Hill area include Union Hill Church, Union Grove Church, Shelton’s Store, numerous houses, and many mapped and unmapped cemeteries. All of these are located on previous plantation lands. Three African American churches are located within the proposed historic district: Saint Joy Baptist Church, Union Hill Baptist Church, and Union Grove Baptist Church. Union Hill and Union Grove have congregations that date to 19th century. Mulberry Grove Baptist Church, a white church organized in 1786, served African-American members and is the second-oldest surviving church in Buckingham County. Union Hill Baptist was established in 1868 after Freedmen separated from Mulberry Grove. At least twenty-one slave, or African-

⁶⁰ *Id.*

⁶¹ Union Hill/Wood’s Corner Rural Historic District: Most Endangered Historic Place in Virginia Application (filed Feb. 16, 2016), prepared by Lakshmi Fjord, Ph.D. Previous historic research of this community for the application to Preservation Virginia for Most Endangered Historic Place in Virginia" listing in 2016 included locating existing family deeds post-1869 after the Buckingham Courthouse was burned, destroying records of enslavement; plantation family blogs; newspaper articles of the time; plantation family documents in the University of Virginia Special Collections; and self-published histories by Charles White, Sr., *The Hidden and Forgotten: Contributions of Buckingham Blacks to American History* (1985) and *The Courthouse Burned*, Vol I, Margaret Pennington and Lorna S. Schott, McClung Publishers (1977).

American, cemeteries are located within the proposed district boundaries.⁶² Community members have voiced concerns that additional unmarked grave sites may be in the path of the ACP or the compressor station in Buckingham County. Caesar Perkins, a formerly enslaved man who became a member of Virginia's General Assembly, lived in the district boundaries, and some of his descendants remain in the Union Hill area.⁶³

VDEQ and the Air Pollution Control Board should not follow the mistakes made by the Federal Energy Regulatory Commission ("FERC") when it ignored the historical and cultural significance of the cohesive Union Hill community. When FERC completed its draft environmental impact statement ("draft EIS") for the ACP, it ignored the Union Hill community. FERC's failure to see Union Hill was in stark contrast to the consideration given to the Norwood-Wingina Rural Historic District—a predominantly white area in neighboring Nelson County. Following concerns raised by that community, Atlantic planned alternative pipeline routes to steer away from that historic district. The draft EIS notes that, following comments, Atlantic "incorporated a route modification that would avoid the Norwood-Wingina Rural Historic District" so that there would be no effects on cultural resources in the district.⁶⁴ The Commission considered other alternatives to avoid any additional impact on the district.⁶⁵ The census tract (Nelson County, CT 9501) where the Norwood-Wingina Rural Historic District is located is less racially diverse than the Commonwealth as a whole.⁶⁶

In contrast, when summarizing comments received about impacts on historic districts and related cultural resources, the draft EIS makes no mention of the Union Hill community.⁶⁷ When considering an alternative location for the compressor station, one that would have been about 2 miles away from the center of the Union Hill community, FERC only considered how the alternative site would affect the other neighboring historic districts, making no mention of the

⁶² *Id.*

⁶³ *Id.*

⁶⁴ Draft Environmental Impact Statement for the Atlantic Coast Pipeline Project and Supply Header Project under FERC Docket No. CP15-554 et al. (Dec. 30, 2016) (eLibrary No. 20161230-4000) at 4-425 ("DEIS")

⁶⁵ Final Environmental Impact Statement for the Atlantic Coast Pipeline and Supply Header Project under FERC Docket No. CP-15-554 et al. (July 21, 2017) (eLibrary No. 20170721-4000) at 3-26 ("Final EIS").

⁶⁶ This census tract is approximately 80 percent white, and only about 18.5 percent African American. U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates, Data Set S1701, <https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>.

⁶⁷ DEIS at 5-21, 4-425.

Union Hill community.⁶⁸ The Commission's conclusion that the Buckingham "compressor station is located near previously developed residential and commercial areas and is consistent with the existing visual conditions in the area" is not accurate.⁶⁹ Nor is the summary dismissal of the concerns from the Union Hill community in the final environmental impact statement adequate to cover the site suitability concerns raised here.⁷⁰

This industrial facility is proposed for a largely residential, predominantly African American, historic, and agricultural community that is ill-suited to a polluting compressor station. The Air Board should consider these relevant factors when making its independent site suitability assessment and deny the permit.

II. Technical Comments on Deficiencies in the Draft Permit

The following technical comments were prepared by Vicki Stamper⁷¹ and pertain to the Virginia Department of Environmental Quality's (VDEQ's) proposed permit for Atlantic's proposed Buckingham Compressor Station, Registration Number 21599.

The Buckingham Compressor Station is proposed to consist of four gas-fired Solar compressor turbines (emission unit IDs CT-01, CT-02, CT-03, and CT-04), a Hurts S45 Boiler (WH-01), four ETI WB line heaters (LH-01, LH-02, LH-03, and LH-04), one Caterpillar emergency generator (EG-01), one accumulator tank (TK-1), one pipeline fluids tank (TK-2), one aqueous ammonia storage tank (TK-3), and various operational natural releases associated with station components (FUG-01) and piping fugitive emissions (FUG-01).⁷² VDEQ describes the operation of the compressor station as follows:

Compressor turbines work by converting the energy in the fuel gas to mechanical energy that then powers the pipeline gas compressors. The compressors increase the pressure of the pipeline gas to enable it to move from one location to another, as the gas will flow from higher pressure to lower pressure in the pipeline. The compressor turbines will generate mechanical energy from the combustion of natural gas fuel. Fresh atmospheric air flows through an air compressor, bringing it to higher pressure. Energy is then added by spraying fuel (pipeline natural gas)

⁶⁸ Final EIS at 3-58.

⁶⁹ DEIS at 4-341.

⁷⁰ Final EIS at 4-538.

⁷¹ Resume of Vicki Stamper, **included as Attachment 3.**

⁷² *Id.* at 5.

into the compressed air and igniting it so the combustion generates a high-temperature flow. This high-temperature, high-pressure gas enters a turbine, where it expands, turning a shaft that powers both the turbine's air compressor and other large centrifugal compressors that pressure the pipeline gas.⁷³

Pursuant to Virginia's regulations for new and modified stationary sources, new stationary sources must apply best available control technology (BACT) for each regulated pollutant for which uncontrolled emissions would equal or exceed the emission thresholds listed in 9VAC5-80-1105 C.⁷⁴ The proposed Buckingham Compressor Station is subject to a determination of BACT for nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), and particulate matter (both PM₁₀ and PM_{2.5}).⁷⁵

In addition, Virginia regulations for toxic pollutants from new and modified sources provide that, if a stationary source is not exempt under 9VAC5-60-300 C, D, or E, then it is subject to Virginia's air toxic new source review requirements in 9VAC5-60-320. Those requirements include a provision that no owner of a new source shall cause or contribute to any significant ambient air concentration that may cause or contribute to the endangerment of human health and that the new source shall employ BACT for the control of toxic pollutants.⁷⁶ VDEQ has found that the Buckingham Compressor Station will emit formaldehyde and hexane at levels in excess of the exemption thresholds in 9VAC5-60-300.⁷⁷

Below, we provide comments on the VDEQ's proposed BACT determinations for certain pollutants to be emitted by the Solar combustion turbines and on the air modeling analyses.

A. The NO_x Limits for the Solar Compressor Turbines at the Proposed Buckingham Compressor Station Are Not Reflective of BACT.

The Draft Permit is inadequate because neither DEQ nor Atlantic have evaluated, as required by BACT, the "maximum degree" of NO_x emission reduction from the turbines that can be achieved with the proposed NO_x BACT controls. Atlantic has proposed to equip each of the four Solar compressor turbines with a dry low-NO_x combustion system (SoLoNO_x) and selective

⁷³ VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 4.

⁷⁴ See 9VAC5-50-260 B.

⁷⁵ See VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 9.

⁷⁶ 9VAC5-60-320 1. and 2.

⁷⁷ See VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 6.

catalytic reduction (SCR) to control NO_x.⁷⁸ Although the company initially proposed a NO_x BACT limit of 5.0 parts per million (“ppm”), VDEQ has proposed a limit of 3.75 ppm based on a Draft Permit for a compressor station in Baltimore County, Maryland.⁷⁹ VDEQ proposed a NO_x emission limit of 3.75 ppm at 15 percent oxygen (“@15%O₂”) applicable on a three-hour average basis, but not applicable during periods of startup, shutdown, or when ambient temperatures are below zero degrees Fahrenheit.⁸⁰

The proposed emission limit and associated permit conditions do not satisfy BACT for the compressor turbines to be installed at the Buckingham Compressor Station. BACT is defined in Virginia regulations to require an emissions limitation “based on the *maximum degree* of emission reduction for any pollutant which would be emitted from a new stationary source ...which the board, on a case-by-case basis, taking into account energy, environmental and economic impacts and other costs, determines is achievable...through the application of production processes or available methods, systems and techniques...for control of such pollutant.”⁸¹ The BACT standard cannot allow emissions of any pollutant that would exceed limits otherwise imposed by law.⁸² In conducting a BACT analysis, “consideration shall be given to the nature and amount of the emissions, emission control efficiencies achieved in the industry for the source type, total cost effectiveness, and where appropriate, the cost effectiveness of the incremental emissions reduction achieved between control alternatives.”⁸³

Neither Atlantic nor VDEQ have evaluated the “maximum degree” of NO_x emission reduction from the Solar turbines that can be achieved with the proposed NO_x BACT controls of SoLoNO_x and SCR. As acknowledged by the company, the proposed NO_x BACT limit of 3.75

⁷⁸ *Id.*

⁷⁹ See VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 9.

⁸⁰ Draft Permit for Buckingham Compressor Station, Conditions 20, 21, 22 and 23.

⁸¹ See 9VAC5-50-250 A (emphasis supplied).

⁸² *Id.* (citing to Article 5 (9VAC5-50-400 et seq.) of this part or Article 1 (9VAC5-60-60 et seq.) or Article 2 (9VAC5-60-90 et seq.) of Part II of 9VAC5-60 (Hazardous Air Pollutant Sources).

⁸³ *Id.*

parts per million by volume, dry⁸⁴ (“ppmvd”) @15%O₂ reflects only a 58 percent reduction of NO_x from the 9 ppmvd @15% O₂ pre-control NO_x emission rate of the combustion turbines.⁸⁵

Atlantic appropriately determined that SCR systems were technically feasible for its compressor turbines given that SCR systems have been installed on other simple-cycle combustion turbines.⁸⁶ Though Atlantic did not conclude that an SCR system would be a cost-effective way of meeting BACT requirements, the company nonetheless proposed to install SCR along with SoLoNO_x at the compressor turbines.⁸⁷ VDEQ found that SCR has been proposed at two other compressor stations, and therefore, VDEQ proposed to require SCR along with SoLoNO_x at the four gas-fired compressor engines to meet BACT.⁸⁸

SoLoNO_x along with SCR are justified to meet BACT for NO_x, but neither Atlantic nor VDEQ evaluated the “maximum degree” of NO_x emission reduction that could be achieved with SCR at the Buckingham compressor turbines. SCR can achieve very high levels of NO_x reduction, generally much higher than the 58 percent NO_x control assumed by VDEQ and Atlantic. There are numerous examples of SCR being required as BACT or as a way to meet lowest achievable emission rate (“LAER”) at simple-cycle turbines to achieve a NO_x emission limit in the range of 2.0 to 2.5 ppm, which for the Buckingham compressor turbines would reflect about 72-78 percent NO_x control across the SCR systems.

BASF makes several SCR catalysts that it claims can achieve up to 97 percent NO_x reduction.⁸⁹ The NO_xCat ETZ catalyst is specifically designed for simple-cycle power generating turbines and other high temperature turbine applications.⁹⁰ The NO_xCat VNX and ZNX catalysts can achieve up to 99 percent NO_x reduction and are most effective at a

⁸⁴ It is assumed that the limits proposed by the VDEQ would apply on a parts per million by volume, dry basis (ppmvd), and if so, VDEQ should so indicate.

⁸⁵ May 25, 2018 Minor New Source Review Permit Application for Buckingham Compressor Station at 8.

⁸⁶ *Id.* at 38.

⁸⁷ *Id.* at 39-40.

⁸⁸ See VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 9.

⁸⁹ See BASF, SCR Catalysts for Power Generation, at <http://www.basf-qtech.com/p02/USWeb-Internet/catalysts/en/content/microsites/catalysts/prods-inds/stationary-emissions/scr-cat-pow-gen>.

⁹⁰ See BASF, NO_xCat ETZ, available at <http://www.basf-qtech.com/p02/USWeb-Internet/catalysts/en/content/microsites/catalysts/prods-inds/stationary-emissions/nOx-Cat-ETZ>.

temperature range of 550 to 800 degrees Fahrenheit.⁹¹ A related catalyst called NO_xCat VNX-HT is designed for use in aero derivative simple-cycle turbines that can achieve 99 percent NO_x removal and can reach optimal performance at 800 to 850 degrees Fahrenheit.⁹² Based on the stack parameter data provided by Atlantic for the Buckingham compressor turbines, it appears that the units will operate at a lower temperature range, with stack exit temperatures ranging from 700 to 760 degrees Fahrenheit.⁹³ This is still well within the operating range of the NO_xCat VNX and ZNX catalysts.

SCR systems have been required to be installed to meet BACT and LAER at several gas-fired simple-cycle turbines. For example, in a permit analysis for the Mariposa Energy Project to be located in Alameda County, California, the Bay Area Air Quality Management District (BAAQMD) provided numerous examples of simple-cycle gas turbines permitted in the District with one-hour average NO_x limits of 2.5 ppmvd @15%O₂ and required the new simple-cycle gas turbines to meet a NO_x BACT limit of 2.5 ppmvd.⁹⁴ These BACT determinations can also be found in the California Air Resources Board (CARB) BACT Clearinghouse.⁹⁵ Those example simple-cycle turbine NO_x limits with SCR are given in Table 1 below.

⁹¹ See BASF, NO_xCat VNX & ZNX for Power Generation, available at <http://www.basf-qtech.com/p02/USWeb-Internet/catalysts/en/content/microsites/catalysts/prods-inds/stationary-emissions/nox-cat-VNX-ZNX-pow-gen>.

⁹² *Id.*

⁹³ See July 10, 2018 Air Quality Modeling Report, Appendix D, Table D-2.

⁹⁴ See Bay Area Air Quality Management District, Preliminary Determination of Compliance, Mariposa Energy Project, August 2010, at 38-39, http://www.energy.ca.gov/sitingcases/mariposa/documents/others/2010-08-18_Preliminary_Determination_of_Compliance.pdf, **included as Attachment 4.**

⁹⁵ <https://www.arb.ca.gov/bact/bactnew/rptpara.htm>.

Table 1. Examples of Simple-Cycle Turbines in California with NO_x Limits with SCR of 2.5 ppmvd@15%O₂⁹⁶

Facility	NO_x Limit Averaging Time
Panoche Energy Center	1-hour avg
Walnut Creek Energy Park	1-hour avg
Sun Valley Energy Project	1-hour avg
CPV Sentinal Energy Project	1-hour avg
Lambie Energy Center	1-hour avg
Riverview Energy Center	1-hour avg
Wolfskill Energy Center	1-hour avg
Goosehaven Energy Center	1-hour avg

Further, a review of the EPA's RACT (Reasonably Available Control Technology)/BACT/LAER Clearinghouse shows numerous other simple-cycle combustion turbines with NO_x BACT limits of 2.5 ppmvd, as shown in the table below.

⁹⁶ *Id.* at 38.

Table 2. Examples of Simple-Cycle Turbines in EPA’s RACT/BACT/LAER Clearinghouse with NO_x Limits with SCR of 2.5 ppmvd @15%O₂

Facility	RBLC ID Number⁹⁷	NO_x Limit Averaging Time
Bayonne Energy Center LLC	NJ-0086	three-hour avg
Troutdale Energy Center	OR-0050	three-hour avg
Vineland Municipal Electric Utility	NJ-0077	three-hour avg
Bayonne Energy Center LLC	NJ-0075	Not given
PSEG Fossil LLC Kearny Generating Station	NJ-0076	three-hour rolling avg
El Cajon Energy LLC	CA-1174	one-hour avg
Orange Grove Project	CA-1176	one-hour avg
Escondido Energy Center LLC	CA-1175	one-hour avg

A 2.5 ppmvd @15%O₂ NO_x BACT limit for the Buckingham compressor engines reflects 72.2% NO_x control from the 9 ppmvd NO_x rate that will be achieved with the SoLoNO_x controls, and 72.2 percent NO_x control should be readily achievable with the SCR systems to be installed at the Buckingham compressor turbines.

The fact that NO_x limits of 2.5 ppmvd to be achieved with SCR have been required on numerous simple-cycle turbines means that numerous permitting agencies have considered SCR systems achieving that level of control to be cost effective to require as BACT for simple-cycle turbines. Given that the Solar turbines to be installed at the Buckingham Compressor Station are simple-cycle turbines that will likely be operated similar to or even more frequently than simple-cycle power turbines (which typically operate as peaking generators), it is very reasonable to consider the Solar turbines to be installed at the Buckingham Compressor Station to be a similar source category to the simple-cycle power turbines listed in Tables 1 and 2 above. Further, as noted by VDEQ, SCR has been required in air permits for two other compressor stations associated with ACP. Based on the numerous permitted simple-cycle turbines subject to NO_x

⁹⁷ The specific information on these RBLC entries can be found by searching on the RBLC ID number at <https://cfpub.epa.gov/rbhc/index.cfm?action=Search.SearchByRBLCIdentifier>.

limits with SCR of 2.5 ppmvd, the Solar turbines to be installed at Buckingham Compressor Station should be able to meet the same level of NO_x control as has been required as BACT for these other simple-cycle turbines.

For all of the reasons discussed above, NO_x BACT for the four compressor turbines at the Buckingham Compressor Station should be a lower NO_x limit of 2.5 ppmvd @15%O₂, based on SoLoNO_x and SCR controls. Further, VDEQ must consider adoption of a one-hour averaging time, rather than a three-hour averaging time, for the NO_x BACT emission limit, given the numerous BACT decisions for simple cycle turbines listed in Tables 1 and 2 above of 2.5 ppmvd @15%O₂ that apply on a one-hour averaging time. A one-hour averaging time is more stringent than a three-hour averaging time and such an averaging time will ensure protection of the short term Nitrogen Dioxide NO₂ NAAQS which applies on a one-hour average basis.

VDEQ has not established any limits on ammonia slip with the SCRs to be installed at the 4 Buckingham compressor turbines. An SCR system injects ammonia into the gas stream, which reacts with NO_x in the presence of the SCR catalyst to remove NO_x from the exhaust gases. However, some the added ammonia will not react with the NO_x and will “slip” out with the gas stream. Ammonia slip can then react with nitric acid to form fine particulate matter. A 5.0 ppmvd @15%O₂ ammonia limit has been required as an appropriate ammonia slip level for SCR systems at simple cycle gas turbines, and should be required in the permit for the Buckingham compressor turbines to ensure ammonia slip and secondary fine particulate matter is minimized.⁹⁸

Because the NO_x BACT for the four compressor turbines at the Buckingham Compressor Station should be a lower NO_x limit of 2.5 ppmvd @15%O₂, rather than the 3.75 ppmvd proposed in the Draft Permit, the Board should remand the proposed permit to DEQ for reconsideration of NO_x BACT emission limits.

⁹⁸ See, e.g., Bay Area Air Quality Management District, Preliminary Determination of Compliance, Mariposa Energy Project, *supra* n.94, at 88.

B. VDEQ Should Evaluate Electric Compressor Turbines as BACT for All Air Pollutants.

VDEQ's BACT analysis is incomplete because it did not consider the non-emissions alternative of using electric-motor driven compressors instead of gas-fired turbines. Electric motors as prime movers for compressor stations have been recognized as a more efficient and cleaner—with zero emissions at the point of use—alternative to gas turbines.⁹⁹ Electric motors have been found to be a feasible alternative, given that they are “more reliable and more efficient as stand-alone pieces of equipment than either gas engines or gas turbines....[and] are able to ramp up more rapidly than gas-driven prime movers.”¹⁰⁰ Though gas turbines have typically been used, “environmental (mainly air quality) concerns are causing electric motors to become more prevalent.”¹⁰¹ Though a final analysis depends on the energy mix of the electric grid, “the system efficiency of electric motors can be higher than that of gas-based technology, and even if efficiency is lower, electric motors may sometimes reduce GHG emissions.”¹⁰²

EPA guidelines do not prohibit a state permitting agency from considering inherently less polluting alternatives. An oft-cited EPA manual states that “there may be instances where, in the permit authority's judgment, the consideration of alternative production processes is warranted and appropriate for consideration in the BACT analysis.”¹⁰³ VDEQ has not pointed to any state law or regulation that would prohibit the consideration of electric motors for a compressor station as part of BACT.

In this instance, consideration of electric motors is entirely consistent with the permit applicant's defined purpose for the facility. “[T]he permit applicant initially defines the proposed facility's end, object, aim, or purpose — that is the facility's basic design, although the applicant's definition must be for reasons independent of air permitting.”¹⁰⁴ The purpose of the Buckingham

⁹⁹ Jeffery B. Greenblatt, *Opportunities for Efficiency Improvements in the U.S. Natural Gas Transmission, Storage and Distribution System*, Lawrence Berkeley National Laboratory, LBNL-6990E (May 2015), at 12.

¹⁰⁰ *Id.*

¹⁰¹ *Id.* at 13 (citing Compressed Air & Gas Institute, *Compressed Air and Gas Handbook* (2012) at pp. 433–434).

¹⁰² *Id.* at 46.

¹⁰³ Environmental Protection Agency, New Source Review Workshop Manual (Oct. 1990), at B-13.

¹⁰⁴ *In re: Desert Rock Energy Co., LLC*, PSD Appeal No. 08-03 et al., Slip. Op. at 64 (EAB Sept. 24, 2009).

facility is to maintain sufficient pressure in the ACP to keep gas moving through the pipeline.¹⁰⁵ This purpose can be equally achieved with electric motors as with gas-fired turbines. Nothing in this record suggests that the use of electric motors in place of gas-fired turbines would disrupt the applicant's basic business purpose for the proposed facility.

The BACT standard under Virginia law is clear. VDEQ and the Air Board are required to consider “the *maximum degree* of emission reduction for any pollutant” ...which the board, “on a case-by-case basis, taking into account energy, environmental and economic impacts and other costs, determines is achievable...through the application of production processes or available methods, systems and techniques...for control of such pollutant.”¹⁰⁶ Electric motors in place of gas-fired turbines are an available method or technique that would remove the pollutant at the source altogether and should have been considered as part of the BACT review.

C. VDEQ Should Require Continuous Emission Monitoring Systems for NO_x Emissions from the Four Compressor Turbines.

The Draft Permit is inadequate because it does not require sufficiently frequent monitoring to ensure that the compressor station turbines are complying with the BACT emission limits established by the permit. Specifically, the Draft Permit for the Buckingham Compressor Station only requires stack testing once every two years to determine compliance with the BACT emission limits in Conditions 20 through 23 of the Draft Permit, including the NO_x BACT limit.¹⁰⁷ That is not a sufficient stack testing frequency to ensure compliance with the NO_x BACT limits on a continuous basis. While this is an issue with all of the BACT emission limits, our comment focuses on NO_x because there are no other conditions in the permit that will ensure continuous compliance with the NO_x BACT limit. SCR systems can be operated to varying levels of NO_x removal efficiency. While Condition 1 of the Draft Permit requires the SCR system to be in operation at all times the compressor turbine is operating, except during startup and shutdown, there is no requirement in the permit that would ensure that the SCR is being operated in a manner to achieve the necessary NO_x reduction to meet the NO_x BACT limits. Installation of continuous emission monitoring systems (CEMS) for NO_x should thus be

¹⁰⁵ Atlantic Coast Pipeline, LLC Permit Application at p. 1 (May 25, 2018) (setting forth that the purpose of the Buckingham Compressor Station is “to provide compression to support the transmission of natural gas.”).

¹⁰⁶ See 9VAC5-50-250 A (emphasis added).

¹⁰⁷ Conditions 29 and 31 of Draft Permit for Buckingham Compressor Station.

required to ensure continuous compliance with the NO_x BACT limits. With the installation of NO_x CEMs, Atlantic will be readily able to adjust the ammonia injection rate and other SCR parameters to optimize NO_x removal efficiency across the SCR and ensure continuous compliance with BACT emission limits.

Not only would NO_x CEMs ensure continuous compliance with the NO_x BACT limits applicable to the compressor turbines, but NO_x CEMs are the only method that can be used to ensure continuous compliance with the pound per hour (three-hour average) and ton per year NO_x limits of the Draft Permit. The pound per hour NO_x limits apply during normal operation (i.e., not including startup and shutdown) and when temperatures are below zero degrees Fahrenheit during which NO_x emissions from the compressor turbines are expected to rise significantly.¹⁰⁸ The ton per year limits apply to all operations, including startup, shutdown, and periods when temperatures are below zero degrees Fahrenheit.¹⁰⁹ There are no provisions in the permit that would ensure continuous compliance with these NO_x limits during times when temperatures fall below zero degrees Fahrenheit, because the stack testing required by the permit would not be conducted during all these varying periods of operation. Typically, stack testing is done when the unit is operating at maximum capacity (or close to it). While Condition 35.e. of the permit requires the company to maintain on-site records of monthly emissions of NO_x and other pollutants to demonstrate compliance with the ton per year emission limits, the permit provides absolutely no indication as to how those calculations of compliance with the annual ton per year limits are to be determined, nor are any of those calculations required to be submitted to VDEQ.

Further, the VDEQ Permit Analysis indicates that this permit is a “synthetic minor after permit action” permit.¹¹⁰ With respect to the compressor turbines, it appears that the ton per year limits on NO_x, which apply to all periods of operation, are intended to be synthetic minor limits. Otherwise, if annual allowable emissions were calculated based on the pound per hour limits in the Draft Permit, the Buckingham Compressor Station would be considered a major source

¹⁰⁸ The pound per hour NO_x limits in Conditions 20-23 of the Draft Permit are marked with a double asterisk, which states the limit does not apply during periods of startup and shutdown, whereas the 3.75 ppm @15%O₂ NO_x limits do not apply during startup, shutdown, or when ambient temperatures are below zero degrees Fahrenheit.

¹⁰⁹ No exemptions for startup, shutdown, or ambient temperature are listed for the ton per year NO_x emission limits in Conditions 20-23 of the Draft Permit.

¹¹⁰ VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 1.

subject to Title V operating permit requirements. Specifically, the potential to emit NO_x from the four compressor engines, based on the pound per hour emission limits in Conditions 20-23 of the Draft Permit, would be 131.36 tons per year.¹¹¹ This figure exceeds the 100 ton per year major source emission threshold for Title V permitting.¹¹² However, the permit also limits annual NO_x emissions from the four compressor engines to 28.51 tons per year via the annual ton per year NO_x limits in Conditions 20-23 of the Draft Permit. Therefore, the ton per year NO_x limits in Conditions 20-23 of the Draft Permit are intended to be synthetic minor limits intended to keep the Buckingham Compressor Station out of Title V operating permit requirements. Yet the Draft Permit fails to require sufficient monitoring to ensure compliance with the ton per year limits. Because stack testing will not be done during all periods of operation that are subject to the ton per year limit, NO_x CEMs that will continuously monitor NO_x emissions every hour of every day are the only monitoring method that will ensure that annual emissions of NO_x will remain below the ton per year NO_x emission limits as necessary to keep the Buckingham Compressor Station a synthetic minor source.

For all of these reasons, the Draft Permit requirements are inadequate. VDEQ must reject and remand the Draft Permit and direct VDEQ to require CEMs for NO_x to continuously monitor the NO_x emissions from the compressor turbines. Not only is such monitoring necessary to create practically enforceable annual NO_x emission limits sufficient to exempt the Buckingham Compressor Station from Title V permitting, but also the continuous NO_x emission measurements will enable Atlantic to better implement its SCR system to maximum NO_x emission reductions as well as to minimize NO_x emissions during startup and shutdown.

D. BACT for Fugitive Emissions at the Buckingham Compressor Station.

In the Draft Permit, VDEQ has not specifically identified BACT requirements for fugitive emissions for this facility that would bind Atlantic outside of federal regulations. Given the possibility that those regulations could change or be weakened, VDEQ should add a provision that the conditions relating to fugitive emissions apply independently of the relevant federal regulation. According to Atlantic's Permit Application, the proposed compressor station

¹¹¹ This was calculated for the 4 compressor turbines based on the pound per hour NO_x limits in Conditions 20-23 of the Draft Permit, assuming maximum hours of operation per year (i.e., 8760 hours).

¹¹² 9VAC5-80-50.

will include fugitive components including valves, flanges, pumps, etc.¹¹³ Atlantic states “[t]his facility will comply with New Source Performance Standard (“NSPS”) Subpart OOOOa (subject to subsequent modification) which incorporates fugitive emissions monitoring program.”¹¹⁴ VDEQ states in its permit analysis that, while the fugitive leak requirements in the permit may be similar to or identical with the requirements in Subpart OOOOa, the Commonwealth’s regulatory authority for these requirements is the Commonwealth’s BACT requirements.¹¹⁵ As such, VDEQ should specifically identify in the permit all requirements that it is imposing as BACT for fugitive emissions, rather than refer to the NSPS regulations. Specifically, rather than citing to the definition of “fugitive emissions component” in 40 CFR 60.5430a, Permit Condition 7.a should specifically state the definition of “fugitive emissions component” in the permit. This will ensure permanence of the permit requirements applicable to fugitive emissions components in the event that the federal NSPS Subpart OOOOa is revised (something that Atlantic alludes to as a possibility in its permit application). Further, this permit acknowledges that 40 CFR Part 60, Subpart OOOOa applies and that the owner/operator is “responsible for complying with the monitoring, notification, reporting, and recordkeeping requirements of these regulations.”¹¹⁶ To ensure the permanence and integrity of its BACT determination for fugitive emissions to the public in the event the federal NSPS standard in Subpart OOOOa is revised, VDEQ should add a provision clearly stating that the requirements of this permit apply independently from and in addition to the applicable requirements of the NSPS Subpart OOOOa.

The Draft Permit requires the development and implementation of a fugitive emissions component monitoring and repair plan.¹¹⁷ While the Draft Permit has specific information regarding timing of leak detection surveys and deadlines for repair of fugitive emission leaks, the Draft Permit does not require records of such surveys, repair of fugitive emission leaks, and reasons for delay in repair of fugitive emissions leaks to be submitted to VDEQ. Instead the

¹¹³ May 25, 2018 Permit Application for Buckingham Compressor Station at 14.

¹¹⁴ *Id.*

¹¹⁵ See VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 10. See also 9VAC5-80-1105 C and 9VAC5-60-320.2.

¹¹⁶ Draft Permit at 2 (top paragraph).

¹¹⁷ Draft Permit, Condition 7a.

Draft Permit requires records to be kept on site.¹¹⁸ VDEQ must require that Atlantic submit quarterly and annual reports to VDEQ on its fugitive emissions detection and repair work, so that VDEQ can ensure that this BACT requirement is complied with. Submission of regular reports would also help to ensure that fugitive emission leaks are repaired promptly and would thus be minimized to the maximum degree possible. Further, with such information submitted to VDEQ, the general public could have access to such data to assure that fugitive emissions are being reduced to the maximum degree possible.

E. The NAAQS Modeling Analyses for the Buckingham Compressor Station Are Flawed.

The Draft Permit is inadequate because the NAAQS modeling analyses supporting the permit are flawed. The Board should remand the Draft Permit to DEQ to remedy the shortcomings in Atlantic's modeling. 9VAC5-80-1180 of Virginia's air permitting rule provides that "[n]o minor NSR permit will be granted unless it is shown to the satisfaction of the Board that the source will comply with the following standards...3. The source shall be designed, built and equipped to operate without preventing or interfering with the attainment or maintenance of any applicable ambient air quality standard and without causing or exacerbating a violation of any applicable ambient air quality standard. . . ." Accordingly, VDEQ required modeling analyses to demonstrate that the Buckingham Compressor Station would comply with the NAAQS.¹¹⁹ However, Atlantic's NAAQS air modeling analyses are flawed for several pollutants due to failure to model the highest allowable emission rates and the failure to adequately account for emissions during startup and shutdown. These issues are discussed in detail further below.

1. Neither Atlantic Nor VDEQ Modeled the Maximum Short Term Allowable NO_x Emission Rates.

First, Atlantic's air modeling analysis failed to model the maximum allowable emission rates allowed under the terms of the Draft Permit for the one-hour average NO₂ NAAQS. Specifically, Conditions 20-23 of the Draft Permit identify pound per hour emission rates for NO_x applicable on a three-hour average basis for all periods of operation excluding startup and

¹¹⁸ Draft Air Permit, Condition 7.b.

¹¹⁹ See VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, Section VII.

shutdown, but the NO_x emissions modeled by Atlantic are much lower than the pound per hour limits of the permit. This is shown in Table 3 below.

Table 3. Allowable NO_x Pound per Hour Emission Rates and Maximum Hourly NO_x Emission Rates Modeled by ACP

Unit	NO _x limit, lb/hr (3-hr avg) ¹²⁰	Highest NO _x Rate Modeled by ACP, lb/hr ¹²¹
CT-01	9.09	1.95
CT-02	6.01	1.29
CT-03	11.03	2.36
CT-04	3.86	0.83

While both ppm and pound per hour NO_x limits apply under Conditions 20-23 of the permit, the ppm limit does not give a clear indication of what the comparable allowable pound per hour NO_x rate would be. Specifically, the ppm limit is given in terms of parts per million (presumably this is by dry volume basis, but the permit is unclear on this point) corrected to 15 percent oxygen. However the fuel in the compressor turbines will not necessarily be operated @15%O₂. Further, there very well could be moisture in the fuel in excess of the level assumed in the limits that presumably apply on a dry volume basis. Thus, it is difficult to correlate the ppm @15% oxygen limits to a maximum allowable pound per hour NO_x emission rate to be used in the air modeling. Consequently, one cannot find with certainty that the ppm NO_x limits are more restrictive than the pound per hour NO_x limits, and therefore VDEQ must ensure that the pound per hour NO_x emission limits are protective of the one-hour average NO₂ NAAQS.

To the extent VDEQ may claim that the pound per hour NO_x limits only apply to periods of operation below zero degrees Fahrenheit (for which periods Atlantic claims it should not have to show compliance with the one-hour NO₂ NAAQS due to such periods being intermittent¹²²), then VDEQ should label those pound per hour limits as applicable during periods of operation below zero degrees Fahrenheit, and VDEQ should impose pound per hour NO_x limits that apply during all other periods of normal operation that are modeled for compliance with the one-hour

¹²⁰ Draft Air Permit, Conditions 20-23.

¹²¹ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Appendix D, Table D-3.

¹²² *Id.* at 11.

average NO₂ NAAQS. As the modeling currently stands, the modeling for the one-hour average NO₂ NAAQS fails to ensure that the maximum allowable hourly NO_x emissions will not cause or contribute to a violation of the one-hour NO₂ NAAQS.

2. The one-hour Average NO₂ Modeling Fails to Reflect Emissions When Ambient Temperatures Are Lower than Zero Degrees Fahrenheit.

Second, Atlantic's air modeling is incomplete because it fails to present modeling of compliance with the one-hour average NO₂ NAAQS for emissions when temperatures are below zero degrees Fahrenheit. However, Atlantic claims to have modeled allowable emissions during such weather conditions for all other NAAQS averaging periods including the annual average NO₂ NAAQS.¹²³ To justify not presenting the modeling analyses for the one-hour average NO₂ NAAQS under such cold conditions, Atlantic cites to an EPA memorandum which states in part as follows:

...we are concerned that assuming continuous operations for intermittent emissions would effectively impose an additional level of stringency beyond that intended by the levels of the [one-hour average NO₂] standard itself. As a result, we feel it would be inappropriate to implement the one-hour NO₂ standard in such a manner and recommend that compliance demonstrations for the one-hour NO₂ NAAQS be based on emissions scenarios that can logically be assumed to be relatively continuous or which occur frequently enough to contribute significantly to the annual distribution of daily maximum one-hour concentrations.¹²⁴

Notwithstanding EPA's March 1, 2011 memorandum, it is reasonable to consider that, for at least an hour per year on average,¹²⁵ the compressor turbines will operate at much higher NO_x emissions due to temperatures being below zero degrees Fahrenheit. When temperatures fall below zero degrees Fahrenheit, NO_x as well as carbon monoxide emissions and unburnt hydrocarbons increase because the turbine engines increase pilot fuel to improve flame stability and the SoLoNO_x combustion controls will not work effectively.¹²⁶ Indeed the permit does not definitively require operation of the SoLoNO_x controls during periods of temperatures below

¹²³ *Id.*

¹²⁴ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report at 11 (citing EPA Memorandum with Subject "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO₂ National Ambient Air Quality Standard," March 1, 2011).

¹²⁵ *Id.* at 11 (Atlantic indicates that over five meteorological years examined, there were only five hours with temperatures below zero degrees Fahrenheit, which is one hour per year on average).

¹²⁶ As discussed in Solar Turbines Product Information Letter 167, SoLoNO_x Products: Emissions in Non-SoLoNO_x Models, which was attached to ACP's May 25, 2018 Permit Application for the Buckingham Compressor Station.

zero degrees.¹²⁷ It also is not clear how the significantly increased NO_x emissions will affect NO_x removal efficiency of the SCR system during such low temperature periods. Given that the SCR will be designed to have a much lower input NO_x emission rate, it seems likely that the SCR would not remove NO_x to the same control efficiency as it will during temperatures above zero degrees Fahrenheit. Thus, emissions of NO_x during these cold temperature timeframes, even if very infrequent, will be much higher than the worst case emissions during other periods. In fact, Atlantic's Modeling Protocol indicated that NO_x emissions during temperatures below zero degrees Fahrenheit could be as follows¹²⁸:

CT-01: 26.4 lb/hr
CT-02: 42.4 lb/hr
CT-03: 62.4 lb/hr
CT-04: 76.0 lb/hr

These rates are much higher than the maximum pound per hour NO_x limits in Conditions 20-23 of the Draft Permit and presumably do not reflect any control by the SoLoNO_x combustion controls or the SCR. In its subsequently submitted modeling report, Atlantic assumed maximum hourly NO_x rates for operations below 0 degrees Fahrenheit at the same pound per hour limits in Conditions 20-23 of the Draft Permit.¹²⁹ The exact basis for those emission limits has not been explained, and we ask VDEQ and Atlantic to provide the assumptions that went into those pound per hour NO_x emission limits including the assumed uncontrolled NO_x rate and the level of NO_x removal presumed to occur across the SCR when temperatures are below zero degrees Fahrenheit.

It appears that Atlantic has performed modeling for one-hour NO₂ concentrations at the higher NO_x emission rates allowed in the pound per hour limits of Conditions 20-23 of the Draft Permit, but those modeling results are not presented in its July 10, 2018 Air Modeling Report. According to Atlantic's Modeling Protocol, the company planned to evaluate ambient air impacts for a range of operating conditions, including conditions below zero degrees Fahrenheit.¹³⁰ While Atlantic may be relying on EPA's March 1, 2011 Memorandum as a reason

¹²⁷ Draft Permit, Condition 1.

¹²⁸ April 6, 2018 Revised Air Quality Modeling Protocol for Buckingham County Compressor Station, Appendix C, Table C-4.

¹²⁹ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Appendix D, Table D-2.

¹³⁰ April 6, 2018 Revised Air Quality Modeling Protocol for Buckingham County Compressor Station at 6.

for ignoring that modeling, that is not what EPA's March 2011 guidance provides for. Instead, EPA's guidance states that EPA did not find it appropriate to assume in the modeling that intermittent emissions occur every hour of the year. There are other ways VDEQ could account for emissions during cold temperatures in the one-hour NO₂ NAAQS analysis. Atlantic said that it found over five meteorological years, that there were 5 hours of below 0 degree Fahrenheit temperatures and that they all occurred in one year.¹³¹ The most obvious way to account for this scenario in the one-hour NO₂ NAAQS analysis would be to assume that the maximum hourly NO₂ concentration modeled in a year would be due to operations when temperatures are below zero degrees Fahrenheit (i.e., assuming that on average, one hour per year the temperatures are below zero degrees Fahrenheit ¹³²), and then to determine the expected NO₂ concentration based on the average of the 7th highest (rather than the 8th highest) modeled NO₂ concentration per year to predict the three-year average 98th percentile NO₂ concentration expected as a result of the Buckingham Compressor Station.¹³³ Another method would be to take the 3rd highest NO₂ concentration predicted for 2015 from the modeling of maximum normal source operations (taking the 3rd highest predicted NO₂ concentration, rather than the 8th highest, to reflect the fact that there were five hours in 2015 of ambient temperatures below zero degrees Fahrenheit, when the maximum NO₂ emissions and thus maximum NO₂ concentrations would occur) and average that value with the 8th highest modeled NO₂ concentration for the other two years modeled in predicting the expected three-year average 98th percentile NO₂ concentration for comparison to the one-hour average NO₂ NAAQS. Either one of these options would be consistent with EPA's 2011 memo and not consider the worst case below zero emissions as occurring every hour of the year, but would still realistically account for the fact that actual emissions from the compressor engines may be much higher and cause much higher hourly NO₂ concentrations for 1 to 5 hours per year.

The public deserves to know the maximum predicted ambient air impacts that could occur due to the Buckingham Compressor Station, and VDEQ has an obligation to ensure that the NAAQS will not be violated as a result of allowing the Buckingham Compressor Station to

¹³¹ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report at 11.

¹³² Based on the actual finding that over five years of weather data at the Lynchburg Regional Airport, there were five hours (all in 2015) that were below zero degrees Fahrenheit.

¹³³ As described in ACP's modeling report, the form of the one-hour NO₂ NAAQS is based on the three-year average of the 98th percentile (i.e., 8th highest) hourly NO₂ concentration. July 10, 2018 Modeling Report at 11.

be constructed. Thus, VDEQ should not ignore the much higher NO_x emissions that could occur, even if infrequently, during times when temperatures fall below zero degrees Fahrenheit.

3. Atlantic Did Not Adequately Account for Emissions in Its Modeling of Startup and Shutdown Emissions.

Third, Atlantic's modeling is insufficient because it vastly underestimates the level of emissions that would occur during startup and shutdown operations. According to Atlantic, to account for ambient air impacts of the compressor turbines during startup and shutdown, which are projected to last about ten minutes each, it developed a blended-emission rate to be modeled for the startup and shutdown scenarios.¹³⁴ Specifically, Atlantic determined a blended-emission rate to model based on the emission rates expected during startup and shutdown provided by the turbine manufacturer and the emissions during normal operations that produce the highest pollutant concentration.¹³⁵ However, a comparison of the emissions assumed in terms of pound per event to the emissions data provided by the turbine manufacturer¹³⁶ shows that Atlantic greatly understated the emissions expected per startup and shutdown event in its modeling. This is demonstrated in Tables 4 and 5 below.

¹³⁴ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report at 8, 23, and Table D-4 in Appendix D.

¹³⁵ *Id.* at 8 and Table D-4 of Appendix D.

¹³⁶ Solar Turbines Product Information Letter 170, Emissions Estimates at Start-up, Shutdown, and Commissioning for SoLoNO_x Combustion Productions, which was attached to ACP's May 2018 Permit Application.

Table 4. Startup Emission Rates per Event for the Four Buckingham Compressor Engines from the Turbine Vendor¹³⁷ Compared to the Startup Emission Rates per Event Assumed by Atlantic in its Air Modeling Analyses¹³⁸.

Unit ID #	Model	NO_x per startup (lb/event)	CO per startup (lb/event)	UHC¹³⁹ per startup (lb/10 min)	NO_x Startup (lb/event) assumed by ACP	CO Startup (lb/event) assumed by ACP	PM10 & PM2.5 Startup (lb/event) assumed by ACP
CT-01	Solar Mars 100	1.4	123.5	7.1	1	46	0.06
CT-02	Solar Taurus 70	0.8	73.1	4.2	1	88	0.06
CT-03	Solar Titan 130	1.9	176.9	10.1	1	55	0.11
CT-04	Solar Centaur 50L	0.8	69.1	4.0	0.3	21	0.03

¹³⁷ *Id.* at Table 3 “Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNO_x CS/MD [Compressor Set/Mechanical Drive] Applications.”

¹³⁸ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Table D-4 of Appendix D.

¹³⁹ UHC refers to unburned hydrocarbons, and it is assumed such unburned hydrocarbons are in the PM2.5 particulate size range.

Table 5. Shutdown Emission Rates per Event for the Four Buckingham Compressor Engines from the Turbine Vendor¹⁴⁰ Compared to the Shutdown Emission Rates per Event Assumed by ACP in its Air Modeling Analyses.¹⁴¹

Unit ID #	Model	NO_x per shutdown (lb/event)	CO per shutdown (lb/event)	UHC¹⁴² per shutdown (lb/event)	NO_x Shutdown (lb/event) assumed by ACP	CO Shutdown (lb/event) assumed by ACP	PM10 & PM2.5 Shutdown (lb/event) assumed by ACP
CT-01	Solar Mars 100	1.7	149.2	8.5	1	6.56	0.1
CT-02	Solar Taurus 70	1.1	93.4	5.3	1	4.96	0.07
CT-03	Solar Titan 130	2.4	207.6	11.9	2	7.28	0.15
CT-04	Solar Centaur 50L	0.4	35.4	2.0	1	2.96	0.05

It must be noted that these startup and shutdown emission rates provided by the turbine vendor are not warranted “under any circumstances,”¹⁴³ which means that the vendor is not guaranteeing that emissions during startup and shutdown events will be able to remain below these emissions levels. Thus, emissions during startups and shutdowns could be higher than stated in the vendor information. Further, the emission rates are based on ambient temperature of 59 degrees Fahrenheit and other standard conditions.¹⁴⁴ As shown in Atlantic’s evaluation of emissions scenarios at various ambient temperatures, emission rates of NO_x, CO, and

¹⁴⁰ Solar Turbines Product Information Letter 170, Emissions Estimates at Start-up, Shutdown, and Commissioning for SoLoNO_x Combustion Productions, at Table 3 “Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNO_x CS/MD [Compressor Set/Mechanical Drive] Applications.” This document was attached to ACP’s May 2018 Permit Application.

¹⁴¹ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Table D-4 of Appendix D.

¹⁴² UHC refers to unburned hydrocarbons, and it is assumed such unburned hydrocarbons are in the PM2.5 particulate size range.

¹⁴³ ¹⁴³ Solar Turbines Product Information Letter 170, Emissions Estimates at Start-up, Shutdown, and Commissioning for SoLoNO_x Combustion Productions, at Table 3 “Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNO_x CS/MD [Compressor Set/Mechanical Drive] Applications.”

¹⁴⁴ *Id.*

PM2.5/PM10 are highest in the lowest temperature scenarios.¹⁴⁵ Thus, the vendor's emission rates for startup and shutdown events would likely be higher during periods of temperatures below 59 degrees Fahrenheit.

Atlantic stated that it blended the vendor provided emissions per startup or shutdown event with the worst-case emissions scenarios for normal source operation in modeling startup and shutdown emissions. However, because Atlantic greatly understated the amount of emissions per startup and shutdown event, the company's blended emission rate for its startup/shutdown modeling were significantly understated. We calculated proper blended hourly emission rates, using the pound per event emission rates provided by the turbine vendor (reflected in the 3rd, 4th, and 5th columns from Tables 4 and 5 above) and using Atlantic's worst-case emissions scenario for each pollutant from Table D-4 of Appendix D of its July 10, 2018 modeling report. We calculated the blended hourly emission rate assuming the startup or shutdown emissions occurred over 10 minutes and the worst case normal operations emissions scenario occurred over 50 minutes. The results of our calculations are provided in Tables 6 and 7 below and are compared to the emission rates modeled by Atlantic in its startup and shutdown modeling.

¹⁴⁵ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Table D-2 of Appendix D.

Table 6. Calculated Hourly Blended Emission Rates for the Buckingham Compressor Engines Based on Vendor Emission Rates for Startup¹⁴⁶ and Worst Case Hourly Normal Operation Emission Rates¹⁴⁷, Compared to the Startup Blended Emission Rates Modeled by ACP¹⁴⁸

Unit ID #	Model	NO_x Blended Emission Rate for Startups (lb/hr)	CO Blended Emission Rate for Startups, one-hour Avg CO Modeling, (lb/hr)	PM10/2.5 Blended Emission Rate for Startups (lb/hr)	ACP's NO_x Emission Rate Modeled for Startups (lb/hr)	ACP's CO Emission Rate Modeled for Startups, one-hour Avg CO Modeling, (lb/hr)	ACP's PM10/2.5 Emission Rate Modeled for Startups (lb/hr)
CT-01	Solar Mars 100	2.85	125.38	9.48	2.45	47.88	2.83
CT-02	Solar Taurus 70	1.74	74.33	5.77	1.94	89.22	1.87
CT-03	Solar Titan 130	3.63	179.13	12.98	2.72	57.23	3.44
CT-04	Solar Centaur 50L	1.40	69.88	5.01	0.90	21.77	1.20

¹⁴⁶ See Table 4 above and Solar Turbines Product Information Letter 170, Emissions Estimates at Start-up, Shutdown, and Commissioning for SoLoNOx Combustion Productions, at Table 3.

¹⁴⁷ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Table D-4 of Appendix D.

¹⁴⁸ *Id.* at Table D-5.

Table 7. Calculated Hourly Blended Emission Rates for the Buckingham Compressor Engines Based on Vendor Emission Rates for Shutdown¹⁴⁹ and Worst Case Hourly Normal Operation Rates¹⁵⁰, Compared to the Shutdown Blended Emission Rates Modeled by ACP¹⁵¹

Unit ID #	Model	NO _x Blended Emission Rate for Shutdowns (lb/hr)	CO Blended Emission Rate for Shutdowns, 1-hour Avg CO Modeling, (lb/hr)	PM10/2.5 Blended Emission Rate for Shutdowns (lb/hr)	ACP's NO _x Emission Rate Modeled for Shutdowns (lb/hr)	ACP's CO Emission Rate Modeled for Shutdown, 1-hour Avg CO Modeling, (lb/hr)	ACP's PM10/2.5 Emission Rate Modeled for Shutdowns (lb/hr)
CT-01	Solar Mars 100	3.15	151.08	10.88	2.45	8.44	2.84
CT-02	Solar Taurus 70	2.04	94.63	6.87	1.94	6.18	1.87
CT-03	Solar Titan 130	4.13	209.83	14.78	3.72	9.51	3.44
CT-04	Solar Centaur 50L	1.00	36.18	3.01	1.60	3.73	1.20

As Tables 6 and 7 show, Atlantic's blended-emission rates for the startup and shutdown modeling are understated, significantly so for carbon monoxide and PM10/PM2.5. With respect to the PM10/PM2.5 emission rates assumed by Atlantic for the 24-hour average PM10 and PM2.5 NAAQS analyses, another reason for the large discrepancy is because the company calculated a blended-hourly-emission rate for the modeling that reflects 10 minutes of operation in startup or shutdown mode and 23 hours and 50 minutes of operation in normal source

¹⁴⁹ See Table 5 above and Solar Turbines Product Information Letter 170, Emissions Estimates at Start-up, Shutdown, and Commissioning for SoLoNOx Combustion Productions, at Table 3.

¹⁵⁰ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Table D-4 of Appendix D.

¹⁵¹ *Id.* at Table D-5.

operation mode.¹⁵² However, this is not reflective of the maximum allowable emission rate during startup and shutdown under the terms of the permit. While there are limits on total hours of time spent per year in startup and in shutdown,¹⁵³ there are no limits on how many startups or shutdowns can occur in a 24-hour period, nor are there any numerical emission limits that apply during startup and shutdown.¹⁵⁴ Under the terms of the permit, each compressor engine would not be subject to any emissions limit for up to 16.7 hours per year for startups and up to 16.7 hours per year for shutdowns.¹⁵⁵ Yet, Atlantic assumed only one startup or one shutdown would occur in a 24-hour period for its PM_{2.5} evaluation. In actuality, several startup and shutdowns would be allowed to occur in a 24-hour period. While that may not be likely, the evaluation of compliance with the NAAQS is supposed to be based on the worst-case allowable emission rates. EPA's Guideline on Air Quality Models requires that the emissions modeled for a new source for the short term NAAQS (i.e., NAAQS with 24-hour or shorter averaging time) be based on the maximum-allowable-hourly-emission rate and assuming continuous operation at that emission rate.¹⁵⁶ The approach that Atlantic assumed for hourly PM_{2.5} emission rates (i.e., assuming one startup or one shutdown per 24 hours) does not comport with EPA's modeling guidelines and it is not consistent with the scenario the company modeled for the one-hour average NAAQS. It is also inconsistent with what Atlantic claimed to have modeled in its modeling report. Specifically, Atlantic claimed "...the combustion turbine startup and shutdown scenarios and normal operation scenario have been modeled for all hours of the day."¹⁵⁷ It was also VDEQ's understanding that the blended startup and shutdown emission rates were modeled for all hours of the year.¹⁵⁸ This issue also applies to the 8-hour average CO NAAQS modeling, for which Atlantic developed a blended emission rate assuming startup emissions for 10 minutes and assuming normal source operation emission rates for 7 hours and 50 minutes.

¹⁵² *Id.*, note c.

¹⁵³ Condition 4.g. of Draft Permit.

¹⁵⁴ *Id.*

¹⁵⁵ *Id.*

¹⁵⁶ 40 C.F.R. Part 51, Appendix W, Table 8-2.

¹⁵⁷ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report at 10.

¹⁵⁸ Email to David Neal, Southern Environmental Law Center, Aug. 30, 2018.

VDEQ must require Atlantic to revise its startup and shutdown modeling analyses to properly assess worst-case ambient-air impacts due to the startup and shutdown emissions allowed under the terms of the permit. Such revised modeling must be grounded in the emission rates provided by the turbine vendor that occur during startup and shutdown from the various turbines, and must ensure that the maximum allowable short term average emission rates will comply with all NAAQS as required by EPA's Guidelines on Air Quality Models. Until new modeling is performed and made available for public review, VDEQ cannot definitively find that the Buckingham Compressor Station will not interfere with attainment or maintenance of the NAAQS.

4. Atlantic Did Not Adequately Model All Contributing Emissions in its Cumulative NAAQS Compliance Analysis.

Fourth and finally, Atlantic's NAAQS compliance analysis is inadequate because Atlantic failed to model actual short-term emission rates for contributing sources for the short-term average NAAQS modeling, and failed to include all nearby sources that could produce a significant concentration gradient near the compressor station. According to Atlantic's July 2018 modeling report, the company included nearby source emissions as listed in Appendix G of its modeling report to determine the total modeled concentrations of relative pollutants.¹⁵⁹ A review of the sources and emission rates listed in Appendix G reveal the following deficiencies in Atlantic's cumulative modeling analysis:

a. Atlantic Did Not Model Maximum Actual Short Term Average Emission Rates for Contributing Sources for the Short Term Average NAAQS Modeling.

A review of the pound per hour emission rates modeled for the contributing sources shows that Atlantic determined hourly emission rates based on the annual emission rates assuming the sources operated 8,760 hours per year. For every source and emission unit listed in Appendix G of ACP's July 2018 modeling report, the pound per hour emission rate reflects the annual emission rate modeled, assuming those emissions are spread evenly across all 8,760 hours in a year.¹⁶⁰ This very likely understates hourly emission rates and thus calls into question the

¹⁵⁹ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report at 23.

¹⁶⁰ For example, for Greif Packaging, BLR05, the annual NO_x is listed as 260.4 tpy and the hourly NO_x rate is listed as 59.45 lb/hr, which reflects 260.4 tpy x (2000 lb/ton)x (1 yr/8760 hours). This is the same for every source listed in Appendix G of APC's July 10, 2018 modeling report and for every pollutant.

cumulative modeling for the short term average (24-hour or shorter averaging time) NAAQS. Furthermore, it is not consistent with the EPA's Guideline on Air Quality Models, which requires nearby sources be modeled using temporarily representative operating levels when the emissions unit is actually operating, reflective of the most recent two years of operation. Thus, the cumulative analysis of compliance with the short term average NAAQS conducted for the Buckingham Compressor Station fails to adequately reflect cumulative impacts with the allowable emissions from the Buckingham Compressor Station and other nearby sources.

b. Atlantic Did Not Include All Nearby Sources that Could Produce a Significant Concentration Gradient in the Vicinity of the Buckingham Compressor Station.

It is not clear how VDEQ decided those sources that should be included in the cumulative modeling assessment of the Buckingham Compressor Station. There is at least one other source in the vicinity of the proposed Buckingham Compressor Station that was not included in the cumulative NAAQS modeling—the Dominion–Bear Garden Generating Station.

The Dominion–Bear Garden Generating Station is a 590 megawatt gas-fired power plant in Buckingham County. It appears to be roughly eight or nine miles from the proposed Buckingham Compressor Station. Atlantic failed to include emissions from this large power plant (owned by an affiliated company of Dominion Energy) in its cumulative emissions analysis. VDEQ should have required including all nearby sources, meaning those that could cause a significant pollutant concentration gradient in the area impacted by the Buckingham Compressor Station.

F. Atlantic Has Not Adequately Demonstrated that the Buckingham Compressor Station Will Not Cause or Contribute to Any Concentration Exceeding or Which May Exceed a Significant Ambient Air Concentration for Air Toxics.

The Draft Permit violates Virginia law by failing to demonstrate that the proposed compressor station will not cause or contribute to any concentration exceeding, or that may exceed, significant ambient air concentration for two air toxics: formaldehyde and hexane. Virginia's regulation for toxic pollutants from new and modified sources provides that if a stationary source is not exempt under 9VAC5-60-300 C, D, or E, then it is subject to Virginia's air toxic new source review requirements in 9VAC5-60-320. Those requirements include a provision that no owner of a new source shall cause or contribute to any significant ambient air concentration that may cause or contribute to the endangerment of human health and that the

new source shall employ BACT for the control of toxic pollutants.¹⁶¹ VDEQ has found that the Buckingham Compressor Station will emit formaldehyde and hexane at levels in excess of the exemption thresholds in 9VAC5-60-300.¹⁶² As such, the Buckingham Compressor Station is subject to the following Virginia standard for formaldehyde and hexane:

Regardless of any provision of any other regulation of the board, no owner or other person shall cause or permit to be discharged into the atmosphere from any affected facility any emissions of toxic pollutants in such quantities as to cause, or contribute to, any significant ambient air concentration that may cause, or contribute to, the endangerment of human health.¹⁶³

Consequently, Atlantic conducted air dispersion modeling for the formaldehyde and hexane emissions.

Virginia's regulations require that "[a]mbient air concentrations shall be determined using air quality analysis techniques (modeling) based on emission rates equal to the facility's potential to emit for the applicable averaging time or any other method acceptable to the board" and that "[a]mbient air concentrations shall include all emissions from the stationary source, including those from sources exempted under 9 VAC 5-60-300 C."¹⁶⁴

"Potential to emit" is defined in Virginia's air toxics regulation as "an emission rate based on the maximum capacity of a stationary source to emit a toxic pollutant under its physical or operational design. Any physical or operational limitation on the capacity of the source to emit a toxic pollutant, including air pollution control equipment, and restrictions on the hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design only if the limitation or its effect on emissions is state or federally enforceable. Fugitive emissions shall be included in determining a stationary source's potential to emit."¹⁶⁵

1. Comments on Modeling of Formaldehyde

In its air modeling report, Atlantic identifies the pound per hour formaldehyde rates that it assumed for the 50 percent, 75 percent, and 100percent operating emissions scenarios during normal source operations. But the formaldehyde hourly emission rates identified by Atlantic are

¹⁶¹ 9VAC5-60-320 1. and 2.

¹⁶² See VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 6.

¹⁶³ 9 VAC5-60-320.1.

¹⁶⁴ 9VAC5-60-350 B. and C.

¹⁶⁵ 9VAC5-60-310 C.

the same for all three levels of operation.¹⁶⁶ Based on the formaldehyde emission factor identified in the permit application of 2.88×10^{-3} pounds formaldehyde per million British Thermal Unit heat input (lb/MMBtu)¹⁶⁷, it is clear that Atlantic modeled emissions at the 50 percent operating capacity for all three operating scenarios of 50 percent, 75 percent, and 100 percent operating capacity.¹⁶⁸ This does not make sense. The pound per hour formaldehyde emission rates at 100 percent operating factor should be twice that of the pound per hour emission rate at 50 percent operating factor. Thus, Atlantic's normal source operation modeling is significantly flawed and understates worst case impacts because it failed to model the hourly potential to emit of the compressor turbines. The maximum emissions scenario for normal operations should have been as follows, with the rate modeled by Atlantic in parenthesis¹⁶⁹:

CT-01: $129.64 \text{ MMBtu/hr} \times 2.88 \times 10^{-3} \text{ lb/MMBtu} = 0.37 \text{ lb/hr}$ (0.19 lb/hr)
 CT-02: $85.62 \text{ MMBtu/hr} \times 2.88 \times 10^{-3} \text{ lb/MMBtu} = 0.25 \text{ lb/hr}$ (0.12 lb/hr)
 CT-03: $157.2 \text{ MMBtu/hr} \times 2.88 \times 10^{-3} \text{ lb/MMBtu} = 0.45 \text{ lb/hr}$ (0.23 lb/hr)
 CT-04: $54.98 \text{ MMBtu/hr} \times 2.88 \times 10^{-3} \text{ lb/MMBtu} = 0.16 \text{ lb/hr}$ (0.08 lb/hr)

With respect to the startup and shutdown formaldehyde emission rates, it appears that Atlantic blended the startup and shutdown formaldehyde emission rates per startup and shutdown event with the maximum capacity normal operations emission rate calculated above.¹⁷⁰ However, it appears unlikely that Atlantic included other sources of formaldehyde emissions at the Buckingham Compressor Station in the modeling of startup and shutdown emissions of the compressor turbines. Specifically, as shown in Table D-5, the formaldehyde emission rates of

¹⁶⁶ July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Appendix D, Table D-3.

¹⁶⁷ May 25, 2018 Minor New Source Review Permit Application for Buckingham Compressor Station, Appendix C, Table C-11. *See also* Solar Turbines Product Information Letter 168, Volatile Organic Compound, Sulfur Dioxide, and Formaldehyde Emission Estimates, Table 1, in May 25, 2018 Permit Application for Buckingham Compressor Station. This Solar Turbines document identifies the formaldehyde emission rate of 2.88×10^{-3} pounds per million British Thermal Unit heat input as the 95% upper confidence of data emission rate for all engine loads.

¹⁶⁸ For example, the heat input capacity of CT-01 is 129.64 MMBtu/hr. Multiplying that by the formaldehyde emission factors of 2.88×10^{-3} lb/MMBtu and a 50 percent capacity factor equates to a formaldehyde emission rate of 0.19 lb/hr, which is the emission rate ACP listed for CT-01 for all three load scenarios in Table D-3 of its July 2018 modeling report.

¹⁶⁹ Based on the maximum heat input identified for each compressor turbine and the formaldehyde emission rate listed in ACP's May 25, 2018 Minor New Source Review Permit Application for Buckingham Compressor Station, Appendix C, Table C-11.

¹⁷⁰ We calculated the blended emission rates using the 100% operational factors and the formaldehyde emissions per startup and shutdown event, and were able to verify that the pound per hour rates listed in Table D-5 (Modeled Startup/Shutdown Emissions) represent a blending of startup or shutdown emissions with the 100% operational emission rate calculated above, despite Table D-4 of ACP's Modeling Report showing a lower normal operational formaldehyde emission factor being blended with the startup and shutdown emissions per event.

the startup scenario are significantly higher than the formaldehyde emission rates modeled for normal source operations by Atlantic, and yet there was not a significant increase in the modeled formaldehyde concentration. This is demonstrated in the table below.

Table 8. Comparison of Atlantic’s Modeled Formaldehyde Compressor Engine Emission Rates and Predicted Formaldehyde Concentration for Normal Operations and for Startups Blended with Normal Operations.

	ACP Modeled Formaldehyde Emission Rate Normal Operation¹⁷¹	ACP Modeled Formaldehyde Emission Rate Startup Blended with Normal Operation¹⁷²
CT-01	0.19 lb/hr	2.56 lb/hr
CT-02	0.12 lb/hr	4.70 lb/hr
CT-03	0.23 lb/hr	3.09 lb/hr
CT-04	0.08 lb/hr	1.17 lb/hr
Total	0.62 lb/hr	11.52 lb/hr
Max Hourly Formaldehyde Concentration for Modeled Scenario ¹⁷³	38.9 ug/m3	40.5 ug/m3

It is difficult to understand how the modeling of normal operations emissions would equate to a maximum formaldehyde concentration of 38.9 ug/m3, but the modeling of startup emissions that are about 18 times higher than the normal operations emission rates would only increase the maximum formaldehyde concentration by 4.1 percent. Given that it does not appear that any nearby sources of formaldehyde emissions were included in the modeling¹⁷⁴ and it does not appear that any background formaldehyde concentration was included in the modeled results¹⁷⁵,

¹⁷¹ Table D-3 of July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Appendix D.

¹⁷² Table D-5 of July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Appendix D.

¹⁷³ See Table 4-3 of July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report.

¹⁷⁴ The emissions inventory of nearby sources provided in Appendix __ of ACP’s July 10, 2018 modeling report does not list any formaldehyde emission rates. Further, Section 3.9 of ACP’s April 6, 2018 modeling protocol only indicated that offsite sources of NO₂, PM2.5, PM10, and CO may be included in cumulative modeling analyses.

¹⁷⁵ ACP’s July 10, 2018 Modeling Report does not provide any background concentrations for formaldehyde.

it is logical to assume that the modeled formaldehyde concentration for normal operations of 38.9 ug/m³ reflects solely Buckingham Compressor Station sources. Thus, given the significant increase in emission rates modeled for the startup scenario, the only explanation for the startup modeling result being only 4.1 percent higher than the normal operation modeling result is that the startup modeling did not include any other Buckingham Compressor Station sources other than the compressor turbines. Yet, Virginia's air toxics permitting rule requires air modeling to be "based on emission rates equal to the facility's potential to emit for the applicable averaging time" and that "[a]mbient air concentrations shall include all emissions from the stationary source, including those from sources exempted under 9 VAC 5-60-300 C."¹⁷⁶ Thus, to comply with Virginia's air toxics permitting rule, VDEQ must ensure that Atlantic has modeled all sources of formaldehyde emissions at the Buckingham Compressor Station to assess maximum hourly formaldehyde concentrations. This must include the emergency generator which appears to be the primary other emission unit with comparable formaldehyde emissions as the compressor engines, with a formaldehyde emission rate of 2.49 pounds per hour.¹⁷⁷ It also must be noted that it is a very likely scenario that a startup of the compressor engines would occur concurrently with the operation of the emergency generator. If the Buckingham Compressor Station lost power, then the compressor engines would shut down and need to be started up again once the emergency generator was started up and running. Thus, assuming that the startup and shutdown modeling does not include the emergency generator and other sources of formaldehyde emissions, VDEQ must require new modeling of all of the sources of formaldehyde at the Buckingham Compressor Station to properly determine increase in formaldehyde concentration due to the potential to emit of the compressor station.

VDEQ also must require a cumulative modeling analysis of the Buckingham Compressor Station with other sources of formaldehyde in the area. Virginia's air toxics permitting rule requires that Atlantic ensure that the Buckingham Compressor Station will not "cause, *or contribute to*, any significant ambient air concentration that may cause, or contribute to, the endangerment of human health."¹⁷⁸ As stated above, it does not appear that Atlantic conducted any cumulative assessment of whether formaldehyde concentrations in the area will exceed the

¹⁷⁶ 9VAC5-60-350 B. and C.

¹⁷⁷ Table C-10 of July 10, 2018 Modeling Report.

¹⁷⁸ 9 VAC5-60-320.1 (emphasis added).

ambient air concentrations that VDEQ has determined to be significant ambient air concentrations (determined as provided in 9VAC5-60-330).

2. Comments on Modeling of Hexane

In estimating emissions and modeling these events, Atlantic understated hexane emissions and/or took into account conditions that the permit would not allow. (Hexane emissions primarily are due to the venting of gas, such as during blowdown events and pigging events.) Therefore the Draft Permit rests on inadequate hexane analysis that must be corrected in a revised permit.

First, in its determination of uncontrolled emissions from blowdowns, Atlantic states that it did not take credit for the use of a planned vent gas reduction system to reduce system pressure prior to venting, meaning that its uncontrolled emissions reflect a blowdown from maximum station operating pressure (1400 pounds per square inch-gauge (“PSIG”)) versus 30 PSIG.¹⁷⁹ However, the Draft Permit states as a permit condition that a compressor turbine may not vent gas unless the compressor turbine case pressure is less than or equal to 44.7 pounds per square inch-absolute (“PSIA”).¹⁸⁰ Atlantic estimated a much higher volume of gas and thus a higher amount of hexane emissions by assuming a blowdown from maximum station operation pressure rather than assuming a 44.7 PSIA gas pressure limit. However, by assuming a much higher gas pressure than allowed in the permit, Atlantic presumably also assumed a comparatively higher gas discharge velocity than is allowed by the permit in its modeling, which would then essentially assume a higher level of discharge in the air and allow for more dispersion of the gas and hexane emissions in the air. Modeling hexane at a higher gas discharge velocity would result in the model predicting lower hexane concentrations than may actually occur with a blowdown event at the Buckingham Compressor Station. Given the permit limit of not discharging gas at a pressure of any higher than 44.7 PSIA for blowdown events, VDEQ must ensure that the modeling of hexane for blowdown events is based on gas flow assumptions that are consistent with the terms of the permit.

Second, as with the formaldehyde modeling, it does not appear that Atlantic has conducted any cumulative analysis of hexane concentrations expected with the Buckingham

¹⁷⁹ May 25, 2018 Permit Application for Buckingham Compressor Station at 15, 28.

¹⁸⁰ Condition 6.a. of Draft Permit.

Compressor Engine and any other sources of hexane in the area. VDEQ must require a cumulative modeling analysis of the Buckingham Compressor Station with other sources of hexane in the area. Virginia's air toxics permitting rule requires that Atlantic ensure that the Buckingham Compressor Station will not "cause, *or contribute to*, any significant ambient air concentration that may cause, or contribute to, the endangerment of human health."¹⁸¹

CONCLUSION

Because of the errors in the Draft Permit, as well as the unanswered questions about risks to human health, greenhouse gas pollution, and environmental justice, the Virginia DEQ should withdraw the Draft Permit and require supplemental information from Atlantic. In the event VDEQ nevertheless submits the Draft Permit to the Air Pollution Control Board, we respectfully ask that the Board deny the permit.

Sincerely,



David Neal



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¹⁸¹ 9 VAC5-60-320.1 (emphasis added).

ATTACHMENT 1

Union Hill Community Household Study Results
Friends of Buckingham, Lakshmi Fjord, Ph.D.
Sept. 4, 2018

Union Hill Community Household Study Results
 Friends of Buckingham, Lakshmi Fjord, Ph.D.
 Sept. 4, 2018 (updated)

Using U.S. Postal Service rural Blue Address markers, **98 households were identified in 1.1 mile radius of proposed Atlantic Coast Pipeline Virginia compressor station in Union Hill, Buckingham, VA.** Teams reached **75 households** or **76.53% response rate**.

Weekday residents of 75 households: **199**

Weekend, bi-monthly, and annual family reunion numbers add hundreds more frequent visitors.

Race by self-identification: Taken together minorities make up 83% of residents:

	African American	Native American and African American	White	Native American and White	Native American	Hispanic
Count	123	27	33	9	3	3
%	61.80904523	13.5678392	16.58291457	4.522613065	1.507537688	1.507537688

Weekday residents household ages: Taken together 32% are Children; 25% Elderly, which is disproportionately people over 75 years old (age range masks actual ages):

Age Range	0-5	6-18	18-21	22-40	41-65	65+	Unknown	Total
Count	28	36	5	36	43	50	1	199
%	14.070351	18.090452	2.5125628	18.090452	21.608040	25.12562	0.50251256	100

Of the 67 households from which we were able to have extensive questionnaire time, **35 responded with their existing medical conditions**. Therefore there is **health data for 59.32% of the reached households**. Existing health diagnoses include:

Highest levels of existing diagnosed health conditions are for autoimmune conditions (asthma, allergies, multiple sclerosis, lupus) and lung/respiratory conditions, heart disease and heart conditions, and diabetes. Other conditions include arthritis, bipolar disorder, cancers including brain cancer, epilepsy, kidney conditions, migraines, light sensitivity, noise sensitivity, skin disease, and strokes.

ATTACHMENT 2

Environmental Justice Review of Virginia's Gas Infrastructure,
Memorandum to Governor Northam
Aug. 16, 2018

To: Governor Northam
From: Advisory Council on Environmental Justice
Re: Environmental Justice Review of Virginia's Gas Infrastructure
Date: August 16, 2018

Dear Governor Northam:

The Advisory Council on Environmental Justice (ACEJ) was established to provide advice and recommendations to the Governor to improve equity in decision-making and improve public health in marginalized communities, among other goals listed in Executive Order 73 (EO 73) from October of 2017.¹ We appreciate the opportunity to communicate our first formal set of environmental justice concerns to the Executive Branch since our inauguration six months ago. Investigating and evaluating the proposed MVP and ACP pipeline and its' associated infrastructure has raised a myriad of issues (legal, scientific, technical, environmental, cultural, political, economic and social justice) that challenge our complete comprehension and integration. Consequently, we vigorously recommend the Governor use this situation as an opportunity to engage and encourage our state agencies to collaborate proactively to educate themselves and the public on the complex links and impacts of fossil fuel use on human health and quality of life. These links are many, both historic and current and the potential future impacts are likely to be felt most severely by our poor, minority and marginalized communities and community members. The people who have to live with the consequences of a decision should get to make that decision or at least have meaningful involvement in the decision-making process.

Historically the term environmental justice has meant ensuring that vulnerable populations including low income and/or minority populations are not disproportionately affected by environmental exposures that have known adverse effects. The Environmental Protection Agency defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The term has its roots in Civil Rights law, specifically Title VI of the 1964 Civil Rights Act, which prohibits discrimination on the basis of race, color, and national origin in programs and activities receiving federal financial assistance. For states like Virginia with significant diversity, it is necessary to examine the use of state-level policy mechanisms, such as eminent domain, to ensure their use does not result in discriminatory acts against its citizens.

The Council's examination of evidence submitted from the Union Hill in Buckingham County community has revealed to us that this community, like many others within the state,

¹ The duties of the Governor's Advisory Council are to provide advice and recommendations to the Executive Branch on the following: Integrating environmental justice considerations throughout the Commonwealth's programs, regulations, policies, and procedures; 2. Improving the environment and public health in communities disproportionately burdened by environmental pollution and risks; 3. Ensuring transparent, authentic, and equitable engagement in decision-making, building capacity in disproportionately burdened communities, and promoting collaborative problem-solving for issues involving environmental justice; 4. Strengthening partnerships on environmental justice among governmental agencies, including Federal, State, Tribal, and local governments; 5. Enhancing research and assessment approaches related to environmental justice; 6. Receiving comments, concerns, and recommendations from individuals throughout the Commonwealth; and 7. Developing resources and strategies to provide and disseminate information to the public. See <https://www.naturalresources.virginia.gov/media/governorvirginiagov/secretary-of-natural-resources/pdf/eo-73-establishment-of-an-advisory-council-on-environmental-justice.pdf>.

has a significant population fitting the environmental justice criteria. Many of Buckingham's residents, because of their race or color, have been the historical recipients of unequal treatment, for which the above-listed Executive Order was signed to serve as a remedy. Therefore, we encourage that these recommendations (and others that may be directed to the Governor from this Commission in the future) be viewed through this lens so that the state of Virginia can ensure policies, programs and practices will not have unintended consequences that harm citizens who have a history of disenfranchisement. Additionally, the Council recognizes the lack of bottom up participation and consultation among Virginia's Indigenous Peoples regarding "Free, Prior, and Informed Consent" (FPIC), as defined in the United Nation's Declaration on the Rights of Indigenous Peoples (UNDRIP) in 2007.²

In order to move Virginia forward ensuring its place as a leader in environmental justice, addressing the global climate crisis, and building a 21st Century clean energy economy we recommend that the governor direct state permitting agencies to prioritize renewable energy solutions, and quickly transition away from fossil fuels. The Governor's Advisory Council on Environmental Justice (ACEJ) recommends that the 401 Clean Water Act certifications for the Atlantic Coast Pipeline (ACP) and the Mountain Valley Pipeline (MVP) be rescinded immediately. Likewise ACEJ recommends that the Governor direct DEQ to suspend the permitting decision for the air permit for the Buckingham compressor station pending further review of the station's impacts on the health and the lives of those living in close proximity. We also recommend that a review of permitting policies and procedures take place and that the governor direct the Air Pollution Control Board, DEQ, and DMME to stay all further permits for ACP and MVP to ensure that predominately poor, indigenous, brown and/or black communities do not bear an unequal burden of environmental pollutants and life-altering disruptions. These actions would ensure that environmental justice has meaningful influence in all current and future energy projects.

Our concerns fall into seven areas:

- 1) Residents of Buckingham have provided comment to the Council that raise questions about the need for the pipeline given decreasing domestic demand
- 2) The Council recommends that if there is a change in demand that renewables be prioritized over natural gas.
- 3) Residents have provided comment to the Council about the potential for civil rights violations.
- 4) Union Hill Compressor Station in Buckingham County (ACP CS-2) may have a disproportionate impact on this predominately African American community and could be perceived as exhibiting racism in siting, zoning, and permitting decisions and public health risk;
- 5) Federal and state review of assessments of risk for cultural and historical resources as a result of the Mountain Valley Pipeline (MVP) and the Atlantic Coast Pipeline (ACP) are incomplete;
- 6) The Council has concluded that federal and state reviews of water quality risks from the MVP and the ACP have not adequately assessed potential impacts for vulnerable populations; and

² US support of UNDRIP was announced in 2010.
http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf.

- 7) Methane from gas infrastructure has the potential to contribute significantly to climate change at a time when Virginian's climate impacts are increasing clear and contribute to vulnerability and inequality.

TOPIC ONE: CONCERNS OVER CIVIL AND HUMAN RIGHTS VIOLATIONS

Energy development is possible without infringement of civil rights and human rights.³ It is our hope that our current energy systems will take into account vulnerable and marginalized communities who may be impacted by developments and that this will be influence when production, processing, and transportation projects are undertaken. Specific civil rights concerns for Union Hill (Buckingham County), in Native American territories, and in rural counties along the pipeline path, are discussed in detail in subsequent sections below.

A controversial aspect of pipeline construction in Virginia involves interpretation of public good for property takings under eminent domain. There is considerable activity in local, state and federal courts and examination of current policies appears necessary and should involve public input.

In counties with pipeline surveying and pre-construction, many property owners assert their property rights are violated and they are mistreated during forced entry. There are a growing evidence of stressful and sometimes traumatic encounters in recorded videos, photographs, and other documentation. There is also a lack of certainty about landowner rights, since eminent domain taking is negatively viewed by most landowners. Stress is amplified by concerns over property value and the potential for a negative impact on public health. Homeowners who may feel that their quality of life has been negatively impacted may be unable to find a buyer, if they wish to leave.

Recommendations:

- 1) We recommend that the Governor's office examine the role of state agencies to ensure that policies with the potential to negatively impact vulnerable communities take the health of those residents into consideration as policies are considered for implementation.

TOPIC TWO: PUBLIC HEALTH CONCERNS WITH COMPRESSOR STATIONS AND RACISM IN THE SITING DECISION FOR ACP CS-2 IN UNION HILL

ACP construction requires three compressor stations: one is located within Virginia and the other two are located near to the state's border. MVP construction has the potential to contribute additional emissions to the existing Transco Pipeline Zone 5 Compressor Station 165 in Pittsylvania County, Virginia.

³ Sovacool, B.K. and Dworkin, M.H. 2015. Energy justice: Conceptual insights and practical applications. *Applied Energy*. 142: 435-444.

The Council would like to highlight the potential for disproportionate impact for this community of Buckingham. For federal permitting, ACP used countywide statistics of 29.1 people per mile. We are informed by the community that nearly all the 99 households living within two miles of CS-2 were not taken into account within the FERC application. The majority (85%) of these households are African American, which is also much higher than the county average reported in the federal application. We believe these citizen concerns are warranted. Table 1 demonstrates annual releases from the proposed >53,000 horsepower compressor station, which would receive gas not only from the ACP, but also from the William's Transcontinental (Transco) Pipeline and its feeder lines. These emission levels are based on information available in the 2015 permit application and 2017 supplement. At the ACEJ meeting on May 30, 2018, we were informed of a new air permit application for ACP CS-2 for which the details were recently made available at:

<https://www.deq.virginia.gov/Programs/Air/BuckinghamCompressorStationAirPermit.aspx> a.

Impacted populations will need sufficient time to consider technical applications. During the 30-day comment period, if abundant public health concerns about emissions arise, the state should consider a delay in providing permits until an independent review can take places.

Table 1: Proposed Annual Releases from CS-2

Pollutant	Annual Air Releases Requested in the 2018 Air Permit Application	Public Health Implications of Pollutants (https://www.epa.gov/criteria-air-pollutants)
Nitrogen Oxides (NO_x)	43.4 tons	Inflammation of the airways, decreased lung function, increased risk of respiratory conditions, and increased response to allergens.
Carbon monoxide (CO)	51.6 tons	Vital organs, such as the brain, nervous tissues and the heart, do not receive enough oxygen to work properly; people have trouble concentrating, lose coordination, and feel tired.
Volatile Organic Compounds (VOCs)	7.69 tons	VOCs can irritate the eyes, nose and throat, can cause difficulty breathing and nausea, and can damage the central nervous system as well as other organs.
Particulate Matter (PM)	43.2 tons	Exposure to PM can lead to premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function growth, exacerbation of allergic symptoms, etc.
Sulphur Dioxide (SO_x)	8.30 tons	Exposure to SO ₂ can harm the human respiratory system and make breathing difficult; SO ₂ contributes to acid rain.
Carbon dioxide equivalent (CO₂e)	295,686 tons	Contribute to climate change with related health impacts, such as increases in distribution and/or intensity of mosquitoes and ticks, allergens, natural disasters, etc.
Methane	70.9 tons	Methane is a potent greenhouse gas; methane gas exposure can cause headaches, dizziness, weakness, nausea, vomiting, and loss of coordination.
Hazardous Air Pollutants (HAPs)	5.3 tons	More than 30 HAPs (e.g., arsenic, benzene, toluene, xylene, etc.) would be released from the proposed compressor station. The levels of formaldehyde and hexane are significant. Formaldehyde: irritation of the skin, eyes, nose, and throat. High levels of exposure may cause some types of cancers. Hexane: dermatitis

		and irritation of the eyes and throat occur with acute and ongoing exposure
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State decisions for infrastructure with significant social and ecological risks, like compressor stations, should not be made hastily, particularly in places like Union Hill where the everyday experiences of residents are shaped by historical experience of racial injustice for a population whose ancestry is rooted in slavery.

During public testimony provided by Buckingham residents, the potential benefits to landowners of the compressor station site when contrasted with potential property value losses for the Freeman Community of Union Hill presents a stark contrast. The slave cemetery on the former Variety Shade Plantation lacks official protection as a historical site. Yet residents regard it as such and received formal recognition in 2016 by Preservation Virginia, a nonprofit who has specialized in Virginian historical preservation for more than a century. In 2017, Union Hill initiated a process for state recognition by filing paperwork with the Department of Historic Resources.

In rural counties in the path of the ACP and MVP pipelines, there is widespread concern that residents shoulder disproportionate risks because of their rural residency. For example, MVP selected to not add the chemical odorant (Mercaptan) as an emergency alert to nearby citizens if a leak occurs, a common precaution in urban areas. Rural populations may not benefit from the pipeline gas, so the absence of protections similar to those provided to urban residents seems unfair given the lack of benefits to balance the potential harms.

Specific examples below go further to suggest discrimination against rural populations based on low population density. For example, the planned width of the pipeline walls is thinner than what would be used if the pipes were located in urban areas. The number of cut-off values is reduced to cut construction costs, sending a message that rural lives value less.

Federal standards allow emergency responsibility to be placed with the Buckingham First Responders. Since this area is zoned for agricultural and residential use, the compressor required a Special Use Permit. Buckingham County First Responders are inadequately prepared for industrial explosions, leaks, and fires. As proposed, a brief training financed by the ACP with an annual refresher may not adequately assure safety.

Alarming, monitoring of CS-2 will occur remotely from West Virginia with on-site supervision only during week days for the first year. Control of the station with highly pressurized and toxic materials will occur by Wi-Fi tower transmission, in spite of the potential for disruption by storms and other hazards. Less risky fiber-optic cables are more reliable. With these cost-savings measures that do not employ existing technology, it seems inaccurate to define the CS-2 as ‘using Best Available Technology’ as suggested by the owner and operator during permit applications.

Recommendations:

- 1) We recommend that the Governor encourage state agencies complete comprehensive social, ecological, and comprehensive health impact assessment for CS-2 based on local

demographic context.⁴ We also recommend that testing occur to assure CS-2 noise levels no higher than 55 decibels (daytime) and 40 decibels (night) and explore protocols to limit the number of blowdowns of CS-2 in addition even further (currently ~10 per year) in addition to adding silencers.

- 2) DEQ's comprehensive Air Dispersion Models for the three ACP compressor stations and for emission increases to Pittsylvania Compressor station due to the MVP should include acute emissions in addition to annual averages. Annual averages can mask short term exposures that may be high enough to have an adverse impact on human health. We recommend that emission information be shared with the impacted community in a public forum with opportunities to ask questions.
- 3) We recommend that the Governor encourage state agencies to work with ACP to complete a Quantitative Risk Assessment (QRA) for CS-2 to protect the health and well-being of local populations and to examine emergency response plans for deficiencies.
- 4) We recommend that the Virginia Department of Health train a current staff member or hire an existing expert to build capacity and knowledge within the state about the potential health impacts of gas infrastructure.

TOPIC THREE: MARGINALIZED GROUPS AND CULTURAL RESOURCES

Federal cultural resource assessments for the ACP and the MVP have not adequately incorporated African American and Native American histories. There are important historical sites along the routes of the pipelines that have not received protected or landmark status.

Native American tribes in the state of Virginia are increasingly recognized on state and federal levels. On January 29, 2018, there was long overdue federal recognition of the Chickahominy, Eastern Chickahominy, Upper Mattaponi, Rappahannock, Nansemond, and Monacan Nations. ACP and MVP consultation with tribes was woefully inadequate during FERC permitting, particularly since federal recognition occurred after FERC approval. State agencies have an opportunity to fill this regulatory gap before issuing permits. Tribal leaders at a federal level have communicated a preference to consult with government intermediaries rather than negotiate directly with energy companies.⁵ Tribes may not want to share locations of cultural resources, such as burial grounds and spiritual sites.

The MVP cultural resource plan was incomplete, and the risks are high. In Virginia, the MVP identified 138 pre-historic and historic sites within a mile and 97 within 0.5 mile. There are 8 sites of an unknown time period, suggesting these have not been adequately studied. The 97 sites within a half mile of the project had not been evaluated for their potential to be eligible to the National Registry of Historic Places (NRHP) before MVP made their cultural resource plan in 2015. MVP noted there were "cemeteries, many not mapped, related to Native Americans, enslaved African Americans, and Euroamericans (including possible Civil War-era burials) that may be in the path of the Project."⁶

⁴ For example, Dr. Lakshmi Fjord, an Anthropologist at the University of Virginia, has collected household data in the 2-mile blast radius of CS-2.

⁵ Lovells, H. 2017. The Federal Energy Regulatory Commission Issues Guidelines for Reporting on Cultural Resources Investigations for Natural Gas Projects: A Summary of the Tribal Engagement Provisions <https://www.jdsupra.com/legalnews/the-federal-energy-regulatory-82749/>.

⁶ Mountain Valley Pipeline. 2015. Resource Report 4: Cultural Resources.

The ACP will uncover Native American settlements or artifacts during construction across hundreds of miles on the lands and along rivers of Powhatan, Monacan, Meherrin, Tuscarora, Nottoway, Cheroenhaka, Nansemond, Lumbee and other nations.⁷ ACP's scattershot dispersal technique to share project information covered mostly non-impacted groups in states other than Virginia. ACP received input from a small number of groups, perhaps due to inadequate consultation techniques relying largely on two form letters and a singular multi-tribe information sessional.

The ACP Pipeline and Compressor Station Two (CS-2) are in the immediate vicinity of slave cemeteries, historical school and churches at the Freedman settlement in Union Hill in Buckingham County. The ACP has not undertaken required Section 106, Historic Preservation Act cultural resource reports for the former Slave/Freedmen community of Union Hill. The ACP does not recognize Union Hill's historical importance and current Freedmen descendant population.

The ACP intersects 140 acres of the Great Dismal Swamp (GDS) (National Wildlife Refuge). ACP is a site of ecological diversity and an important historical area. In the early 1600s, Native Americans fleeing the colonial frontier took refuge in what would become GDS. Details about Native American sites in this area remain incomplete. GDS was a survival oasis, a "thriving refuge" for escaped slaves.⁸ In 2003, the Underground Railroad Network to Freedom Program established a refuge to commemorate the importance of the Great Dismal Swamp as an escape route and place of safety for former slaves. There are active archeological sites in portions of the GDS. Thousands of artifacts have been uncovered, but many areas remain without analysis.⁹

Recommendations:

- 1) With hundreds of archeological sites located within a mile of the ACP and the MVP without historical designation, we recommend that the Governor assess the potential impacts of the ACP and MVP on areas of cultural significance to Native Americans and African Americans. to protect and categorize important cultural sites.
- 2) We recommend that the Governor insure that private and public sector entities improve channels of communication with tribal councils while supporting self-determination. In particular, infrastructure projects like the ACP and MVP should consult tribes about impacts to their land and people. Since tribes were awaiting decision on their federal recognition application, they may not have felt free to communicate concerns about proposed pipeline projects. The global standard established to respect indigenous rights is Free, Prior and Informed Consent. These pipeline projects are currently in pre-construction without FPIC, even from federally recognized tribes.

TOPIC FOUR: STATE REVIEW UNDER THE CLEAN WATER ACT

⁷ Native Land. Our home on native land. <https://native-land.ca/>.

⁸ Grant, R. 2016. Deep in the swamps, Archeologists are finding how fugitive slaves kept their freedom. *Smithsonian Magazine*. <https://www.smithsonianmag.com/history/deep-swamps-archaeologists-fugitive-slaves-kept-freedom-180960122/>.

⁹ Hausman, S. 2014. Fleeing to Dismal Swamp, slaves and outcasts found freedom. *National Public Radio*. <https://www.npr.org/2014/12/28/373519521/fleeing-to-dismal-swamp-slaves-and-outcasts-found-freedom>

ACEJ recognizes clean water is part of the public trust. UN Resolution 64/292, passed in 2010, acknowledged that clean drinking water is essential to the realization of all human rights. Several United States acts, including the Clean Water Act and the Safe Drinking Water Act, protect access of American citizens to clean drinking water. Disruption or contamination of water supply is an environmental justice issue because low-income populations can least afford to purchase water or filtration systems and cannot pay higher taxes for improved infrastructure.

To assure water quality, ACEJ recommends that the state of Virginia review federally permitted projects like the ACP and the MVP to certify that they will comply with state water standards. Pipeline construction will involve crossing 1,556 waterbodies and impact large areas of the state. Based on the best available information, the ACP would cross near intakes of water assessment areas of the (1) City of Staunton-Middle River, (2) City of Norfolk-Western Branch Reservoir, (3) City of Norfolk-Lake Prince, and (4) City of Emporia-Meherrin River.¹⁰ The MVP would cross two source water assessment areas: (1) Western Virginia Water Authority-Spring Hollow, and (2) Town of Rocky Mount-Blackwater River.

Individualized analysis of current conditions and expected impacts is important at every crossing, but especially in areas where water quality is already impaired, in areas of seismic activity or geologic instability, and in zones that are sources of drinking water. In rural areas like Bath, Buckingham, and Nelson Counties, where residents rely on wells, streams, rivers, and reservoirs, citizens are worried and alarmed about potential groundwater pollution from pipeline construction and use.

Independent Geographic Information System (GIS) analysis has identified that the proposed pathway is in proximity to stream crossing and water intakes;¹¹ therefore we recommend state agencies conduct environmental justice review of impacts on water bodies to assure risk to water is carefully assessed. The ACP would cross the Blackwater River approximately 4.5 miles from the City of Franklin (Southampton County). Of the 33 HDD water crossings within two miles of Franklin, most lie proximate to neighborhoods with a majority of people of color.¹²

The legal and regulatory record below suggests the potential for significant ecological harm and the need for additional state review:

- MVP: The DEQ has taken enforcement action against MVP since the start of pre-construction.¹³ Federal regulators halted MVP construction in August of 2018 due to

¹⁰ Hansen, et al. 2018. Threats to Water Quality from the Mountain Valley Pipeline and Atlantic Coast Pipeline Water Crossings in Virginia. https://www.nrdc.org/sites/default/files/threats-to-water-quality-from-mountain-valley-pipeline-and-atlantic-coast-pipeline-water-crossings-in-virginia_2018-02-26.pdf.

¹¹ Detailed route maps are available at the [Pipeline Compliance Surveillance Initiative](https://dpmc-gis.maps.arcgis.com/apps/webappviewer/index.html?id=bad99995a7674146903a3aacb83bd879) (CSI). See in particular <https://dpmc-gis.maps.arcgis.com/apps/webappviewer/index.html?id=bad99995a7674146903a3aacb83bd879>; Hansen, et al. 2018. Threats to Water Quality from the Mountain Valley Pipeline and Atlantic Coast Pipeline Water Crossings in Virginia. https://www.nrdc.org/sites/default/files/threats-to-water-quality-from-mountain-valley-pipeline-and-atlantic-coast-pipeline-water-crossings-in-virginia_2018-02-26.pdf.

¹² Ibid.

¹³ DEQ. Regulatory activities related to the Atlantic Coast and Mountain Valley pipelines in Virginia. https://www.deq.virginia.gov/lists/?action=show_list&id=38&page=1; Lopez, T. 2018. DEQ, MVP broke the

repeated incidents of erosion violations.¹⁴ In August of 2018, the Fourth Circuit Courts vacated the Forest Service and Bureau of Land Management permits for the MVP due to evidence of insufficient environmental review before approval.¹⁵

- ACP: Along with dozens of local organizations, the Southern Environmental Law Center submitted a legal case in 2017 requesting rehearing of FERC review given limitations in review prior to approval. While this court decision is still pending, Senator Kaine has repeatedly requested a new FERC review.¹⁶ ACP has since been cited for erosion violation in West Virginia¹⁷ and violations of tree felling in Virginia.¹⁸ ACP pre-construction was halted in May of 2018 to protect endangered species when protections were found insufficient.¹⁹ In August of 2018, the Fourth Circuit Court vacated National Park Service permit for the ACP due to the permit's fundamental contradiction with the NPS mission.²⁰

Recommendations:

- 1) We recommend that Governor communicate with the State Water Board (SWB) and the Department of Environmental Quality (DEQ) about state review power under Section 401 of the Clean Water Act to assure necessary site-specific assessment.
- 2) We recommend that the Governor embrace site-based stream-by-stream assessment to protect Virginia citizen's right to clean water and ensure safeguards are in place for low-income and vulnerable populations.
- 3) We recommend that the Governor delay MVP pipeline pre-construction and construction until the potential impacts can be more thoroughly reviewed with disproportionate impacts taken into consideration. We also recommend that the state exercise state

law, has inadequate erosion controls. WSLs 10 News. <https://www.wsls.com/news/virginia/deq-mvp-broke-the-law-has-inadequate-erosion-controls>.

¹⁴ Hammack, L. 2018. Federal agency order stop on the entire Mountain Valley Pipeline. *The Richmond Times Dispatch*. https://www.richmond.com/news/virginia/updated-federal-agency-orders-work-to-stop-on-the-entire/article_47640162-9399-5ca1-81b5-4d38be2417a4.html.

¹⁵ Weber, M. 2018. US Court vacates US Forest Service and BLM permits for Mountain Valley Pipeline. *S&P Global Platts*. <https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/072718-us-court-vacates-us-forest-service-blm-permits-for-mountain-valley-pipeline>.

¹⁶ Kaine, T. 2018. Kaine calls for FERC rehearing on Mountain Valley and Atlantic Coast Pipelines. <https://www.kaine.senate.gov/press-releases/kaine-calls-for-ferc-rehearing-on-mountain-valley-and-atlantic-coast-pipelines>.

¹⁷ Miskin, K. 2018. WV DEP pipeline developers failed to control erosion, fail the water quality rules. *WV Gazette Mail*. https://www.wvgazettemail.com/news/wvdep-pipeline-developers-failed-to-control-erosion-follow-water-quality/article_70da3076-0ec4-531f-b4bd-7d3f2b2c1fb0.html.

¹⁸ Zullo, R. 2018. Atlantic Coast Pipeline gets violation notice from state over tree felling. *The Richmond Times Dispatch*. https://www.richmond.com/news/virginia/atlantic-coast-pipeline-gets-violation-notice-from-state-over-tree/article_cde8db97-2e9a-58fa-ad09-93a1ff643ed2.html.

¹⁹ Zullo, R. 2018. Federal appeals court nullifies key permit of the Atlantic Coast Pipeline. *The Richmond Times Dispatch*. https://www.richmond.com/news/virginia/federal-appeals-court-nullifies-key-permit-for-atlantic-coast-pipeline/article_c3da09e8-df8d-56d5-a9dd-3499737b1a14.html

²⁰ Lavoie, D. 2018. Appeals Court Tosses Key Permits for Atlantic Coast Pipeline. *The Washington Post*. https://www.washingtonpost.com/national/energy-environment/appeals-court-tosses-key-permits-for-atlantic-coast-pipeline/2018/08/06/63064dfa-99ca-11e8-a8d8-9b4c13286d6b_story.html?noredirect=on&utm_term=.2f28ca0c4875

authority under SB698 and SB699 to delay construction until this review has taken place.²¹

TOPIC FIVE: METHANE GAS, CLIMATE CHANGE, SEA LEVEL RISE

Methane (CH₄), a potent greenhouse gas, leaks into the earth's atmosphere through the production of gas pipelines across the US.²² Gas systems contribute to climate change more than coal and methane emissions are on the rise. A recent NASA study concluded that fossil fuel development is the source of approximately 68% of the recent rise in methane levels in the atmosphere.²³ The potential cumulative impacts of new gas infrastructure are significant.²⁴

Virginians are already experiencing climate change impacts, such as heat waves, seasonal drought, sea level rise, and intensification of storms. Climate disruption often exacerbates inequalities, creates and reinforces environmental injustice, and causes the greatest harm to poor and vulnerable populations.²⁵ Climate justice advocates assert harm from climate change disproportionately affects communities of color, low-income populations, and the elderly and children. Sea level rise and recurrent flooding are contributing to missed school and work in low-lying areas of the eastern shore and coastal zones (i.e., in Norfolk).²⁶ Hampton Road owners have lost homes when they can no longer obtain or afford flood insurance.²⁷ The perception that low income residential areas and communities of color may not receive equal attention when evacuation and storm recovery plans are made, influences the recommendations made below. Due to recurrent flooding, a percentage of the low-income populations from Tidewater Garden and other public housing projects in Norfolk are to be relocated to new housing through a voucher system by 2020.²⁸ In addition to demonstrating inequality in housing access, climate impacts draw attention to Virginia's unequal medical coverage and to existing gaps in health care access. Climate change can result in increases in pollen and earlier rises in pollen contributing to allergies, increase in vector borne diseases from increases in the populations of ticks and mosquitos, higher potential for heat stroke,

²¹ <http://lis.virginia.gov/cgi-bin/legp604.exe?181+sum+SB698>; <http://lis.virginia.gov/cgi-bin/legp604.exe?181+cab+SC10205SB0699+RCSB3>.

²² Brandt, A.F. et al. 2014. Methane Leaks from North American Natural Gas Systems. *Science*. <http://science.sciencemag.org/content/343/6172/733>

²³ NASA (National Aeronautics and Space Administration). 2018. NASA-led study solves methane puzzle. <https://www.nasa.gov/feature/jpl/nasa-led-study-solves-a-methane-puzzle>.

²⁴ Mayfield, D. 2017. Would the Atlantic Coast Pipeline increase the threat of sea level rise in Hampton Roads? *The Virginian Pilot*. https://pilotonline.com/news/local/environment/article_a949fc72-c07b-5d08-a329-463b1eee32f1.html

²⁵ *United Nations News*. 2016. Inequalities Exacerbate Climate Impacts on Poor and Vulnerable Populations. <https://news.un.org/en/story/2016/10/541743-inequalities-exacerbate-climate-impacts-on-poor-vulnerable-populations-new-un>; Leichenko, R. and O'Brien, K. 2008. *Environmental change and globalization: Double exposures*. Oxford University Press.

²⁶ Kusnetz, N. 2018. Norfolk wants to remake itself as sea level rises, but who will be left behind? *Inside Climate News*. <https://insideclimatenews.org/news/15052018/norfolk-virginia-navy-sea-level-rise-flooding-urban-planning-poverty-coastal-resilience>.

²⁷ Jarvis, B. 2017. When rising seas transform risk into certainty. *The New York Times*. <https://www.nytimes.com/2017/04/18/magazine/when-rising-seas-transform-risk-into-certainty.html>.

²⁸ The New Journal and Guide Staff. 2018. Norfolk's urban renewal program gets underway. *The New Journal and Guide*. <http://thenewjournalandguide.com/norfolks-urban-renewal-project-gets-underway/>.

increase in ground level ozone, all of which combine to intensify health conditions such as asthma, other respiratory diseases, and more.²⁹

An important component of environmental justice is mitigating and preventing releases of methane and other greenhouse gases. Reducing methane emissions is especially important for curbing near-term warming. Because methane only lasts for a decade or so in the atmosphere, reducing emissions can have a near-immediate impact on slowing the rate of warming, which is critical for reducing the impacts that we are already seeing, such as sea level rise and worsened extreme weather events.³⁰

Recommendations:

- 1) We recommend that the Governor direct state agencies model greenhouse gas contributions, including methane, of the proposed ACP and MVP comprehensively so the decision-makers and the public have a more accurate understanding of climate impacts.
- 2) We recommend that the Governor ensure that the state includes GHGs in state assessments and should consider rejecting permits for the ACP and the MVP if climate impacts surpasses other energy options. The New York Governor and state resource agencies canceled proposed gas infrastructure using climate justifications, creating a precedent for state level action.³¹
- 3) We recommend that the Governor rigorously work with governmental and independent agencies to revisit initial economic and other calculations related to gas pipelines. Market shifts suggest there may not be a need for additional capacity given the decreasing domestic demand. This will ensure that low income and minority populations are not disproportionately impacted by the proposal and to assess the potential for comprehensive ecological impacts thoroughly.

²⁹ Natural Resources Defense Council. Climate change and health in Virginia.

<https://assets.nrdc.org/sites/default/files/climate-change-health-impacts-virginia-ib.pdf>.

³⁰ Ocoko, I. 2018. New Science Suggests Methane Packs More Warming Power Than Previously Thought. *Environmental Defense Fund*. <http://blogs.edf.org/energyexchange/2018/02/07/new-science-suggests-methane-packs-more-warming-power-than-previously-thought/>; Howarth, R.W. 2015. Methane emissions and climatic warming risk from hydraulic fracturing and shale gas development: implications for policy. *Energy and Emission Control Technologies*. 3: 45-54.

³¹ Kuznetz, N. 2017. Another pipeline blocked for failure to consider climate emissions. *Inside Climate News*. <https://insideclimatenews.org/news/07092017/new-york-pipeline-permit-rejected-natural-gas-valley-lateral-ferc-climate-change>.

CONCLUSION: OUR PROPOSAL

Virginia's Emergency Task Force on Environmental Justice in Gas Infrastructure

ACEJ recommends an **Emergency Task Force on Environmental Justice in Gas Infrastructure** be convened to assess evidence of disproportionate impacts for people of color and for low-income populations due to gas infrastructure expansion. ACEJ recommends that the Governor direct DEQ to suspend the permitting decision for the air permit for the Buckingham compressor station pending further review of the station's impacts on the health and the quality of life of those living in close proximity. We also recommend that a review of permitting policies and procedures take place and that the governor direct the Air Pollution Control Board, DEQ, and DMME to stay all further permits for ACP and MVP to ensure that predominately poor, indigenous, brown and/or black communities do not bear an unequal burden of environmental pollutants and life-altering disruptions. These actions would ensure that environmental justice has meaningful influence in all current and future energy projects.

Proposed Membership:

- State of Virginia: appropriate agencies (i.e., DEQ, VDH, DSS, DMAS, SHPO, etc.)
- Dominion Energy: Environmental Justice Officer or other representative, company archeologist
- Advisory Council on Environmental Justice (ACEJ) representatives
- Impacted urban and rural populations, including members of Native American nations and Freedman communities
- Civil rights attorneys
- Member of State Control Water Board (selected by SWCB)
- Member of State Air Pollution Control Board (selected by PCB)
- Academia: anthropologists, archeologists, historians, geographers

ATTACHMENT 3

Resume of Vicki Stamper

Curriculum Vitae

Victoria R. Stamper

P.O. Box 9571

Boise, Idaho 83707

stamper.vr@gmail.com

Areas of Expertise

Comprehensive knowledge of the Clean Air Act - accomplished in the requirements for new source review (NSR) and prevention of significant deterioration (PSD) construction permits, Title V operating permits, Maximum Achievable Control Technology (MACT) Approvals, Class I area protection including regional haze plans and best available retrofit technology (BART) determinations, and state implementation plans for compliance with the national ambient air quality standards.

Extensive experience with new source review permitting – have evaluated numerous PSD and synthetic minor permit applications, draft permits, associated air modeling analyses, and determinations of best available control technology.

Professional Experience

Air Quality Consultant

Boise, ID 83707

April 2003 to

Present

I provide consulting services on numerous air quality issues such as:

- Reviewing and commenting on EPA state implementation plan (SIP) actions.
- Reviewing/preparing comments on all aspects of air quality construction and operating permit applications and permits for industrial sources including coal-fired power plants.
- Providing technical expertise for the appeal of air quality permits that do not comply with federal or state clean air requirements.
- Investigating facility compliance with federal and state air quality regulations.
- Analyzing proposed or available mercury and other hazardous air pollutant controls for coal-fired power plants.
- Reviewing and commenting on Class I regional haze and visibility protection plans.
- Evaluating proposed best available retrofit technology determinations.
- Critiquing prevention of significant deterioration increment analyses.
- Evaluating and commenting on air quality analyses and environmental impact statements for proposed oil and gas development in the West.

Environmental Engineer/Legal Assistant
Reed Zars, Attorney at Law
Laramie, WY82070

May 2001 to
April 2003

Responsibilities included:

- Investigating industrial facilities' compliance with Clean Air Act requirements through review of public documents.
- Researching pollution reduction measures and effectiveness.
- Reviewing and preparing comments on proposed air quality construction and operating permits.
- Reviewing and preparing written comments on proposed EPA state implementation plan approvals regarding topics such as opacity regulations, emission limit exemptions, Class I area visibility plans and permitting regulations.

New Source Review Program Manager
Air and Radiation Program
U.S. Environmental Protection Agency, Region VIII
Denver, Colorado 80202

December 1990
to April 2001

Responsibilities included:

- Serving as the Region VIII lead for state rules regarding the new source review and prevention of significant deterioration programs, and industrial source control measures.
- Reviewing all aspects of prevention of significant deterioration increment analyses.
- Reviewing state implementation plans for consistency with requirements of Clean Air Act.
- Preparing documents to justify EPA approval or disapproval of state submittals.
- Educating and assisting tribes in developing regulations for tribal implementation plans.
- Participating in workgroups to ensure national consistency and provide input on rulemakings.
- Reviewing state operating permit programs under Title V of the Clean Air Act.
- Researching and compiling the EPA-approved state implementation plans.
- Developing and reviewing state implementation plans for particulate matter nonattainment areas, as well as assisting in the preparation of requests to redesignate to attainment.
- Reviewing environmental impact statements for consistency with Clean Air Act.
- Serving as primary contact for air quality issues in the state of Wyoming.

Environmental Engineer
Envirometrics, Inc.
Seattle, Washington 98103

August 1989-
July 1990

Responsibilities included:

- Designing components of research projects pertaining to pollution control systems.
- Developing testing criteria and measuring the effectiveness of these control systems.
- Preparing air pollution permit applications and related documentation for industrial sources.
- Compiling input data for modeling of ambient air quality impacts on Class I areas.
- Developing emission inventories.

Selected Reports and Papers

- Stamper, V., Technical Support Document to Comments of Conservation Organizations; EPA's Proposed Regional Haze FIP for Texas, May 3, 2017.
- Stamper, V., Technical Support Document to Comments of Conservation Organizations; Proposed Utah Regional Haze SIP Approval and FIP, March 14, 2016.
- Stamper, V., Technical Support Document to Comments of Conservation Organizations; Proposed Regional Haze FIP for Arkansas, August 5, 2016.
- Stamper, V., Technical Support Document to Comments of Conservation Organizations; EPA's Proposed Reasonable Progress Measures for Texas and Oklahoma, April 27, 2015.
- Stamper, V., Technical Support Document to Comments of Conservation Organizations; Proposed Wyoming Regional Haze Partial SIP Approval and Partial FIP, August 1, 2012.
- Stamper, V., C. Copeland, M. Williams, and T. Spencer (contributing editor), *Poisoning the Great Lakes: Mercury Emissions from Coal-Fired Power Plants in the Great Lakes Region*, Natural Resources Defense Council Publication, June 2012.
- Fox, Phyllis and V. Stamper, Technical Support Document to Comments of Conservation Organizations: Proposed Montana Regional Haze FIP, June 15, 2012.
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- Stamper, V., Review of EPA's Proposed Best Available Control Technology (BART) Requirements for the Four Corners Power Plant on Navajo Nation Land, April 28, 2011.
- Stamper, V. and C. Copeland, *Stop the Rollbacks, Cleaner, Healthier Air for Colorado*, Environmental Defense publication, 2005.
- Banerjee, S. and V. Stamper, *Mercury Air Pollution The Case for Rigorous MACT Standards For Subbituminous Coal*, prepared for Rocky Mountain Office of Environmental Defense and the Land and Water Fund of the Rockies, May 2003.

Education

Bachelor of Science Degree
Civil Engineering, Michigan State University
East Lansing, Michigan

ATTACHMENT 4

Bay Area Air Quality Management District
Preliminary Determination of Compliance
Mariposa Energy Project
August 2010



Preliminary Determination of Compliance

Mariposa Energy Project

Unincorporated Alameda County between Livermore and Byron

Address: 4887 Bruns Road, Livermore, California 94550

Bay Area Air Quality Management District
Application 20737

August 2010

Brenda Cabral, Supervising Air Quality Engineer
Madhav Patil, Air Quality Engineer

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1 Introduction

The Bay Area Air Quality Management District (District) is issuing a Preliminary Determination of Compliance (PDOC) Permit for the Mariposa Energy Project (MEP), a proposed 200-megawatt (nominal) natural gas fired electric power generation facility.

The Preliminary Determination of Compliance sets forth the District's preliminary analysis as to how the facility would comply with applicable air quality regulatory requirements, as well as proposed permit conditions to ensure compliance. The District is publishing this document for public review and comment, and will review and consider all comments received from the public before deciding whether to issue a Final Determination of Compliance (FDOC) for the proposed project.

The proposed Mariposa Energy Project would be a simple-cycle power plant that would be used to meet demand for electrical power during short-term peaks in demand. The proposed power plant would operate as a load-following power plant, providing a power output from a low of 25 MW to a high of 190 MW.¹ The proposed MEP consists of four GE LM 6000 PC-Sprint simple-cycle gas turbines and associated support equipment. These simple-cycle turbines have a high degree of unit turndown, which means a low minimum generation rate relative to the maximum generation rate. Their minimum generation rate is 25 MW and the maximum rate is 48.5 MW. Simple-cycle turbines are well suited for a peaking power plant that may not run for an extended period of time, since this type of unit does not have a steam turbine that would need to be kept warm to avoid equipment damage.

The proposed project would be located in Alameda County, California, approximately 7 miles northwest of Tracy, 7 miles east of Livermore, 6 miles south of Byron, and approximately 2.5 miles west of the community of Mountain House. The facility would be located southeast of the intersection of Bruns Road and Kelso Road on a 10-acre portion of a 158-acre parcel immediately south of the Pacific Gas and Electric Company, Bethany Compressor Station, and the 230-kilovolt Kelso Substation on the southern portion of the Lee Property, between two small hills. Mariposa Energy will construct, own, and operate MEP. Mariposa Energy Project is owned by Diamond Generating Corporation, a wholly owned subsidiary of Mitsubishi Corporation.

This PDOC describes how the proposed Mariposa Energy Project would comply with applicable federal, state, and District regulations. These regulations include the Best Available Control Technology and emission offset requirements of the District New Source Review (NSR) requirements contained in District Regulation 2, Rule 2. This document also includes proposed permit conditions necessary to ensure compliance with applicable rules and regulations, air pollutant emission calculations, and a health risk assessment that estimates the impact of emissions of toxic air contaminants from the project on public health.

The PDOC has been prepared in accordance with District Regulations 2-2-404 through 2-2-406, which set forth the procedural requirements for the issuance of NSR permits, and District Regulation 2-3-403 and 2-3-404, which apply the requirements specifically to power plant permits. The purpose of the

¹ Application for Certification, Volume 1, Page 2-32, June 28, 2009

PDOC is to set forth the reasons and analysis that lead to the District's preliminary determination that the project would comply with all applicable regulatory requirements relating to air quality.

The remainder of this document is organized in the following manner. Section 2 provides an overview of the legal framework for power plant permitting in California and describes how members of the public can learn about the project and provide input to the District and the California Energy Commission. Section 3 describes the proposed Mariposa Energy Project, its location, and the turbine selection process. Section 4 describes the project's emissions. Section 5 describes the "Best Available Control Technology" to minimize air pollution and explains how the BACT requirements will apply to the facility. Section 6 describes the emissions offset requirements for the project and how the proposed facility would comply with them. Section 7 presents the results of the Health Risk Screening Analysis for the project. Section 8 addresses other applicable legal requirements. Section 9 sets forth the proposed permit conditions for the project. Section 10 concludes with the preliminary determination of compliance for Mariposa Energy Project.

2 Power Plant Permitting Process and Opportunities for Public Participation

The California Energy Commission (CEC) is the primary permitting authority for new power plants in California. The California Legislature has granted the Energy Commission exclusive licensing authority for all thermal power plants in California of 50 megawatts or more. (*See Warren-Alquist State Energy Resources Conservation and Development Act, Cal. Public Resources Code §§ 25000 et seq.*) This licensing authority supersedes all other local and state permitting authority. The intent behind this system is to streamline the licensing process for new power plants while at the same time provide a comprehensive review of potential environmental and other impacts.

As the lead permitting agency, the California Energy Commission (CEC) conducts an in-depth review of environmental and other issues posed by the proposed power plant. This comprehensive environmental review is the equivalent of the review required for major projects under the California Environmental Quality Act (CEQA), and the Energy Commission's license satisfies the requirements of CEQA for these projects. This CEQA-equivalent review encompasses air quality issues within the purview of the District, and also includes all other types of environmental and other issues, including water quality issues, endangered species issues, and land use issues, among others.

The District collaborates with the Energy Commission regarding the air quality portion of its environmental analysis and prepares a "Determination of Compliance" that outlines whether and how the proposed project will comply with applicable air quality regulatory requirements. The Determination of Compliance is used by the Energy Commission to assess air quality issues of the proposed power plant. This document presents the District's Preliminary Determination of Compliance (PDOC). The District will solicit and consider public input on the PDOC, and then will issue a Final Determination of Compliance for use by the Energy Commission in its CEQA-equivalent environmental review. The CEC will then conduct its environmental review, and at the end of that process, it will decide whether to issue a license for the project and under what conditions.

Both the Energy Commission's licensing process and District's Determination of Compliance process relating to air quality issues provide opportunities for public participation. For the District's Determination of Compliance, the District publishes its preliminary determination – the PDOC – and invites interested members of the public to review and comment on it. This public process allows members of the public to review the District's analysis of whether and how the facility will comply with applicable regulatory requirements and to bring to the District's attention any area in which members of the public believe the District may have erred in its analysis. This process helps improve the District's final determination by bringing to the District's attention any areas where interested members of the public disagree with the District's proposal at an early enough stage that the District can correct any deficiencies before making the final determination. The Energy Commission provides similar opportunities for public participation, and publishes its proposed actions for public review and comment before taking any final actions.

At this time, the District is at the beginning of this process for the Mariposa Energy Project. The District is publishing its PDOC for public review and comment, and will consider comments from the

public in determining whether to issue a Final Determination of Compliance (FDOC) and on what basis. The District invites all interested parties to comment in writing on any aspect of the PDOC pursuant to District Regulation 2-2-405. Comments should be made in writing and should be directed to Brenda Cabral, Supervising Air Quality Engineer, Bay Area Air Quality Management District, 939 Ellis Street, San Francisco, CA 94109, (415) 749-4674, bcabral@baaqmd.gov. Comments must be received during the comment period ending September 27, 2010. All comments received during the comment period will be considered by the District and addressed as necessary in any Final Determination of Compliance.

The power plant approval process also provides opportunities for members of the public to participate in person in public hearings regarding this project. The District may hold a public meeting in accordance with Regulation 2, Rule 2, Section 405 to receive verbal comment from the public if there is sufficient reason to do so. Members of the public who would like to request that the District hold a public meeting should make such a request, in writing, to Mr. Patil at the address set forth in the preceding paragraph prior to the end of the comment period, and should explain the reasons why a public meeting is warranted. Members of the public will also be afforded an opportunity to participate in public hearings regarding the project at the Energy Commission as part of the Commission's environmental review process. The public hearings before the Energy Commission will encompass all aspects of the project, including air quality issues and all other environmental issues.

Interested members of the public are invited to learn more about the project as part of the public review and comment process. Detailed information about the project and how it will comply with applicable regulatory requirements are set forth in the subsequent sections of this document. All supporting documentation, including the permit application and data submitted by the applicant and all other information the District has relied on in its analysis, are available for public inspection at the Communication and Outreach Division Office located on the 5th Floor of District Headquarters, 939 Ellis Street, San Francisco, CA, 94109. This Engineering Evaluation and the supporting documentation are also available on the District's website at <http://www.baaqmd.gov/>. The public may also contact Mr. Patil for further information (see contact information above). **Para obtener información en español, comuníquese con Brenda Cabral en la sede del Distrito, (415) 749-4686, bcabral@baaqmd.gov.**

In addition to the District's permitting process involving air quality issues, interested members of the public are also invited to participate in the Energy Commission's licensing proceeding, which addresses other environmental concerns including those that are not related to air quality. For more information, go to the following CEC website: <http://www.energy.ca.gov/sitingcases/mariposa/index.html>. The public may also contact the Energy Commission's Public Adviser's office at:

Public Adviser
California Energy Commission
1516 Ninth Street, MS-12
Sacramento, CA 95814
Phone: (916) 654-4489
Toll-Free in California: 1-800-822-6228
E-mail: PublicAdviser@energy.state.ca.us

3 Project Description

The Mariposa Energy Project (MEP) is a proposed 200-megawatt “peaking” power plant to be located in unincorporated Alameda County between Livermore and Byron, California. The MEP would consist of four GE simple-cycle LM 6000 PC-Sprint natural gas fired combustion turbine generators with a total nominal capacity of 200 megawatts. This section describes the proposed project’s function as a simple-cycle “peaker” power plant. It also describes the project location, how it would be operated, provides details about project ownership, and the specific equipment being proposed for the project.

3.1 Mariposa Energy Project: A Simple-Cycle Power Plant

The proposed Mariposa Energy Project would be a simple-cycle “peaker” plant, designed to start up and respond quickly to grid demand, and to operate at a wide range of generation rates, in order to provide electricity to the grid at times of peak demand. Peaking power plants only run during periods of high demand for electricity, most often during the summertime when air conditioning use is highest and typically in the late afternoon when people are returning from work and many businesses remain open. The proposed power plant would operate depending on the demand for electricity in the region. The California Independent System Operator (Cal ISO) would be responsible for dispatching the plant to meet electrical demand.

The proposed project uses a “simple-cycle” design, meaning that it uses natural gas combustion turbines only, without additional generating equipment, to make electricity. This design is different than a “combined-cycle” design, in which waste heat in the turbine exhaust is used to create steam in a heat-recovery steam generator, which powers a steam turbine to generate additional electricity. The simple-cycle design is especially well suited for power plants operating to meet peak demand because the turbines can be started up very quickly when required by demand. With combined-cycle turbines, startups take longer because the heat recovery boilers and steam turbines take additional time to come up to operating temperature. Simple-cycle turbines are also well suited to peaking applications because such plants, by their nature, are not called upon to run for extended periods of time. This is an important consideration because simple-cycle turbines are inherently less efficient than combined-cycle turbines, which recover some of the heat from the turbine exhaust that would otherwise be wasted. Since such plants are operated for a relatively small number of hours per year, this energy penalty – which translates into additional fuel used to generate the same amount of power – is not as much of a concern.

The facility will also help to ensure a reliable supply of power as California transitions to a greater supply of renewable power sources such as solar and wind power. The project will help provide on-demand standby power capacity for grid stability. The simple-cycle turbines have a very short startup time and can come on-line very quickly to fill in during times when solar energy sources or wind power are not available. As the California Energy Commission has recognized, “some efficient, dispatchable, natural-gas-fired generation will be necessary to integrate renewables into California’s electricity system and meet the state’s [Renewable

Portfolio Standard] and [Greenhouse Gas] goals.” Simple-cycle aero-derivative turbine plants fired by clean burning natural gas are well suited to filling this need.

The facility will have approximately a 0.7-mile-long, 230-kV transmission line to deliver the plant output to the electrical grid via the existing 230-kV Kelso Substation located north of the project site. The new 4-inch-diameter 50-foot long natural gas pipeline will run directly northeast from the project site to interconnect with PG&E’s existing high-pressure natural gas pipeline (Line 2). Service water will be provided from a new connection to the Byron Bethany Irrigation District (BBID) via a new pump station and a 6-inch-diameter, 1.8-mile-long pipeline placed in or along the east side of Bruns Road, from existing Canal 45 south to the MEP site.

3.2 Gas Turbine Selection Process

Two types of gas turbines are commonly used in the power generation industry: the large frame heavy-duty design and the aero-derivative gas turbines based on turbine designs typically found in the aircraft industry. Both gas turbines have been widely used and the selection of the turbine is determined by the amount of energy needed and the anticipated cycling duty and load profile.

Mariposa Energy Project considered the use of heavy-duty (i.e., industrial) turbines for MEP. However, industrial gas turbines, such as the General Electric (GE) Frame 7 or Siemens SGT6-5000 units, typically have electrical-generation capacities in the 80 to 190 MW range and are not capable of operating at less than 60% capacity. In contrast, the aero-derivative turbine technology offers efficient operation over the 25 MW and above operating range and varies in size from 14.3 to 50 MW (GE, 2010). One of the requirements that MEP has to meet is a high degree of unit turndown (a low minimum operating rate relative to the maximum output) with the minimum generation rate of 25 MW. The facility is also intended to be a load-following plant, so the plant may be required to supply as low as 25 MW and as high as 190 MW, depending on the demand.²

In order to meet the minimum dispatch requirements of 25 MW, Mariposa Energy LLC selected the aero-derivative turbine technology. The GE LM6000 turbine is a common aero-derivative turbine widely used at peaking facilities in California, with an operating range from approximately 25 to 48.5 MW at 50 percent load and full load, respectively. Mariposa Energy Project considered three LM6000 models available at the time of the release of the Request for Offers (RFO). The three LM6000 models included the LM6000PC (water injected), the LM6000PD (dry low-NO_x or DLE), and the LM6000PF (DLE). The LM6000 turbines also have a SPRINT (Spray Inter-cooled Turbine) technology option. The GE SPRINT technology is GE patented technology that reduces compressor discharge temperature by injecting atomized water into the low- and high-pressure compressors.

According to GE product materials, the SPRINT power augmentation feature results in an increased generating output of approximately 15 percent and 11 percent at ISO (International

² Application for Certification, Volume 1, Pages 1-9 and 2-32, June 28, 2009

Standards Organization)³ condition for the water-injected and DLE models, respectively (GE, 2010). As part of the turbine selection process, the turbine vendor provided performance data for both the water-injected and DLE LM6000 SPRINT gas turbines (see Table 1). As presented in Table 1, the water-injected LM6000 gas turbine (LM6000PC) would result in a higher electrical production rate compared to the DLE models. Although the LM6000PF turbine would have a lower NOx emission rate than the PC or PD models, the DLE models would have higher hydrocarbon and CO emission rates (except at the 17°F temperature case) compared to the water-injected PC turbine.

Therefore, the LM6000PC turbine was selected by Mariposa Energy in order to meet the electrical output and reliability requirements outlined in the Mariposa Energy Project PPA with PG&E.

³ Definition for ISO Condition (International Standards Organization): In order to compare the performance of turbines that can operate in a wide range of atmospheric conditions, the gas turbine output and performance is specified at standard conditions called the ISO ratings.

The three standard conditions specified in the ISO ratings are Ambient Temperature @ 15 deg C, Relative Humidity @ 60 % and Ambient Pressure at Sea Level. The turbines are operated under these above conditions and tested to allow comparisons to be made between different sets of test data.

TABLE 1 COMPARISON OF GE LM6000 SPRINT WATER-INJECTED AND DLE COMBUSTION TECHNOLOGIES

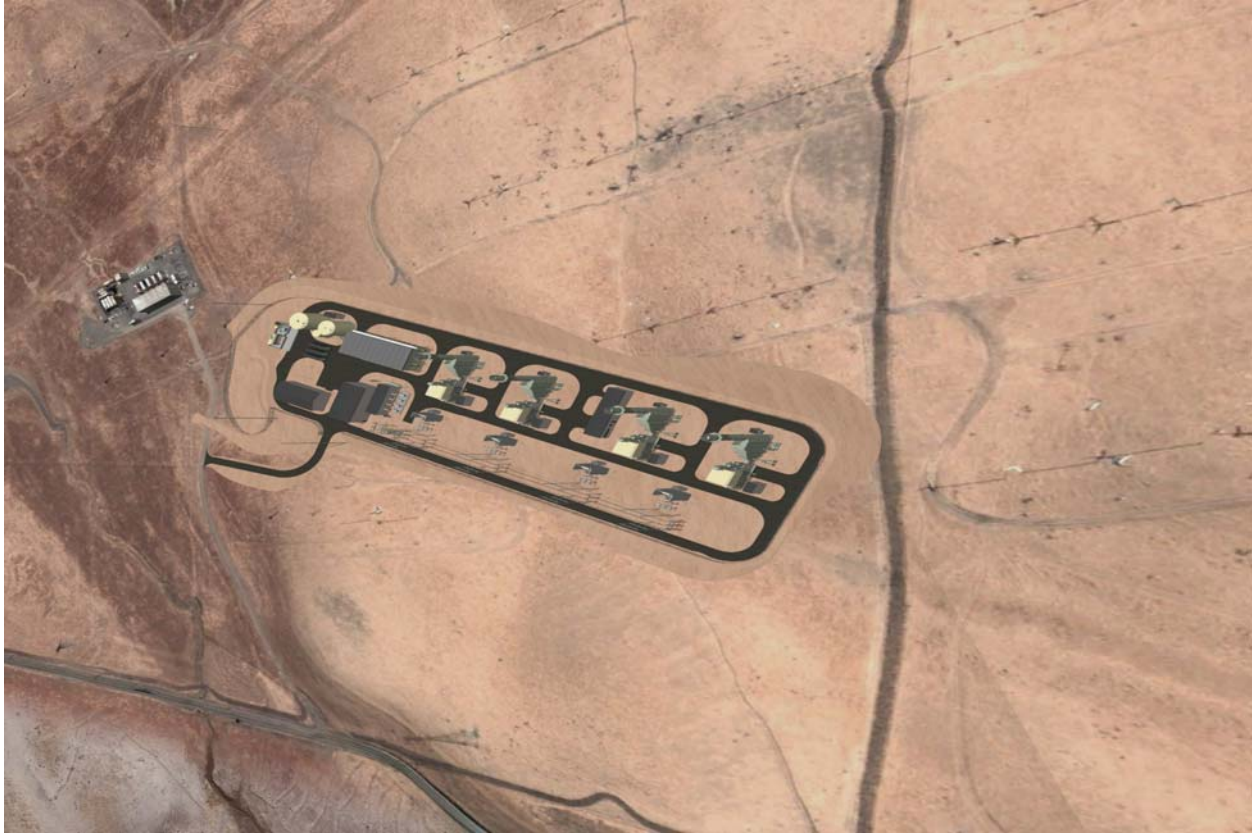
Combustion Technology	PC	PD	PF	PC	PD	PF	PC	PD	PF	PC	PD	PF
Ambient Temperature, °F	17.0	17.0	17	46	46	46	59	59	59	93	93	93
Inlet Conditioning	HEAT	HEAT	HEAT	NONE	NONE	NONE	EVAP	EVAP	EVAP	EVAP	EVAP	EVAP
Load Rate, Percent	100	100	100	100	100	100	100	100	100	100	100	100
Electrical Production, MW	50.2	48.3	47.9	50.7	47.8	47.7	49.7	46.9	46.8	46.3	43.8	43.7
Heat Rate*, Btu/kW-hr, LHV	8461	8115	8128	8548	8238	8248	8566	8276	8283	8647	8407	8414
NOx Control	Water	DLE	DLE	Water	DLE	DLE	Water	DLE	DLE	Water	DLE	DLE
Emissions Rates												
NOx ppmvd Ref 15% O ₂	25	25	15	25	25	15	25	25	15	25	25	15
CO ppmvd Ref 15% O ₂	53.2	25	25	20.9	25	25	15	25	25	7.6	25	25
HC ppmvd Ref 15% O ₂	8.2	15	15	2.2	15	15	2.1	15	15	2.1	15	15
PC = GE LM6000PC SPRINT Turbine PD = GE LM6000PD SPRINT Turbine PF = GE LM6000PF SPRINT Turbine Water = water injected DLE = dry low NOx ppmvd Ref 15% O ₂ = parts per million by volume dry corrected to 15% oxygen HC = precursor organic compounds * estimated												

3.3 Project Location

The proposed Mariposa Energy Project is located in northeastern Alameda County, California, approximately 7 miles northwest of Tracy, 7 miles east of Livermore, 6 miles south of Byron, and approximately 2.5 miles west of the community of Mountain house. The facility would be located southeast of Bruns Road and Kelso Road on a 10-acre portion of a 158-acre parcel immediately south of the Pacific Gas and Electric Company, Bethany Compressor Station, and 230-kilovolt Kelso Substation on the southern portion of the Lee Property, between two small hills.

The proposed project site is in an unincorporated area designated for Large Parcel Agriculture by the East County Area Plan. The Assessor's parcel number is 099B-7050-001-10. The site is located in Township 2S, Range 3E, Section 1 (Mount Diablo Base and Meridian). The 6.5-MW Byron Power Cogen Plant currently occupies 2 acres of the 158-acre parcel. The remainder of the parcel is non-irrigated grazing land.

Mariposa Energy Project Site Location:



**FIGURE 1
PROJECT SITE LOCATION**

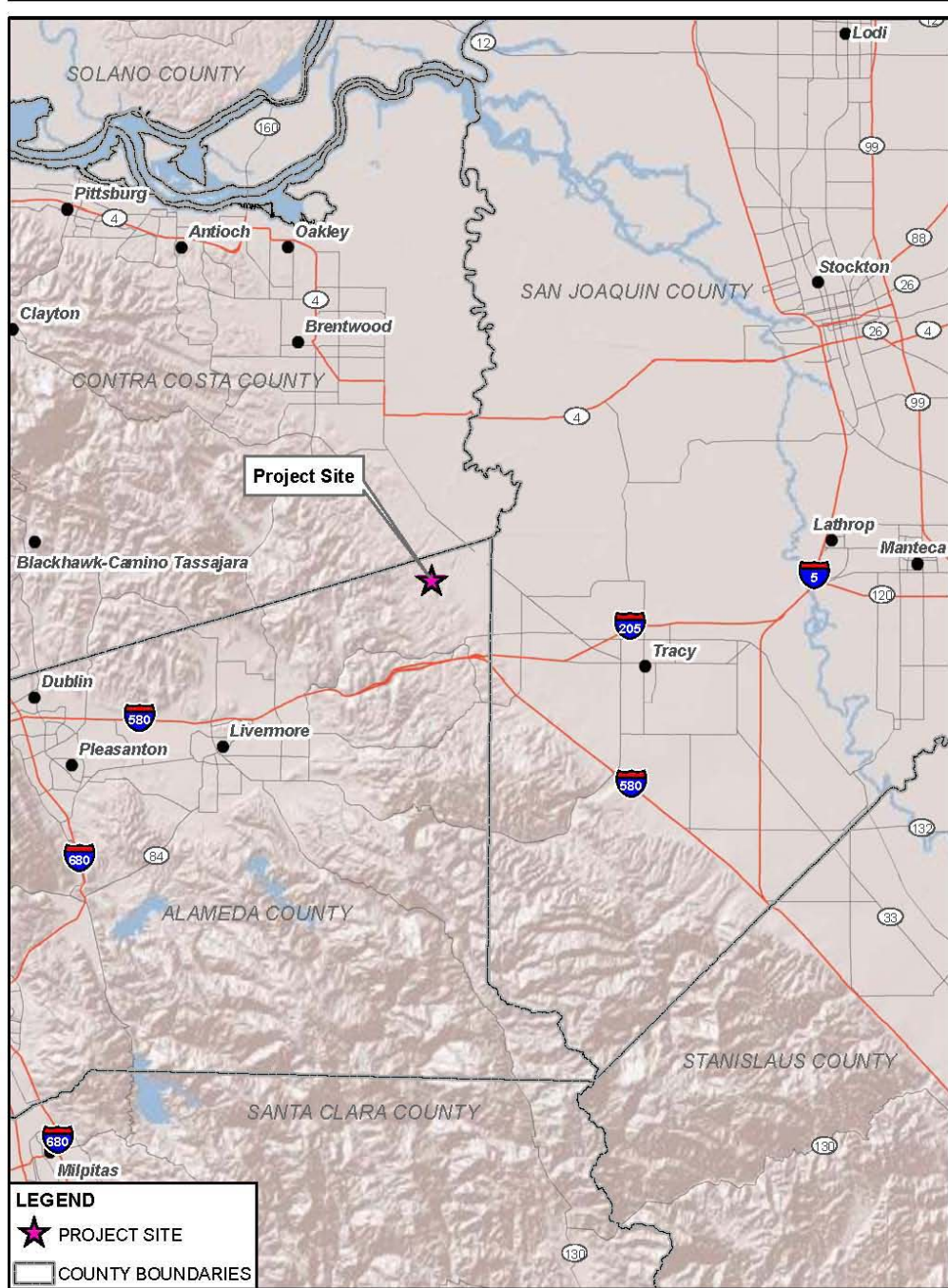
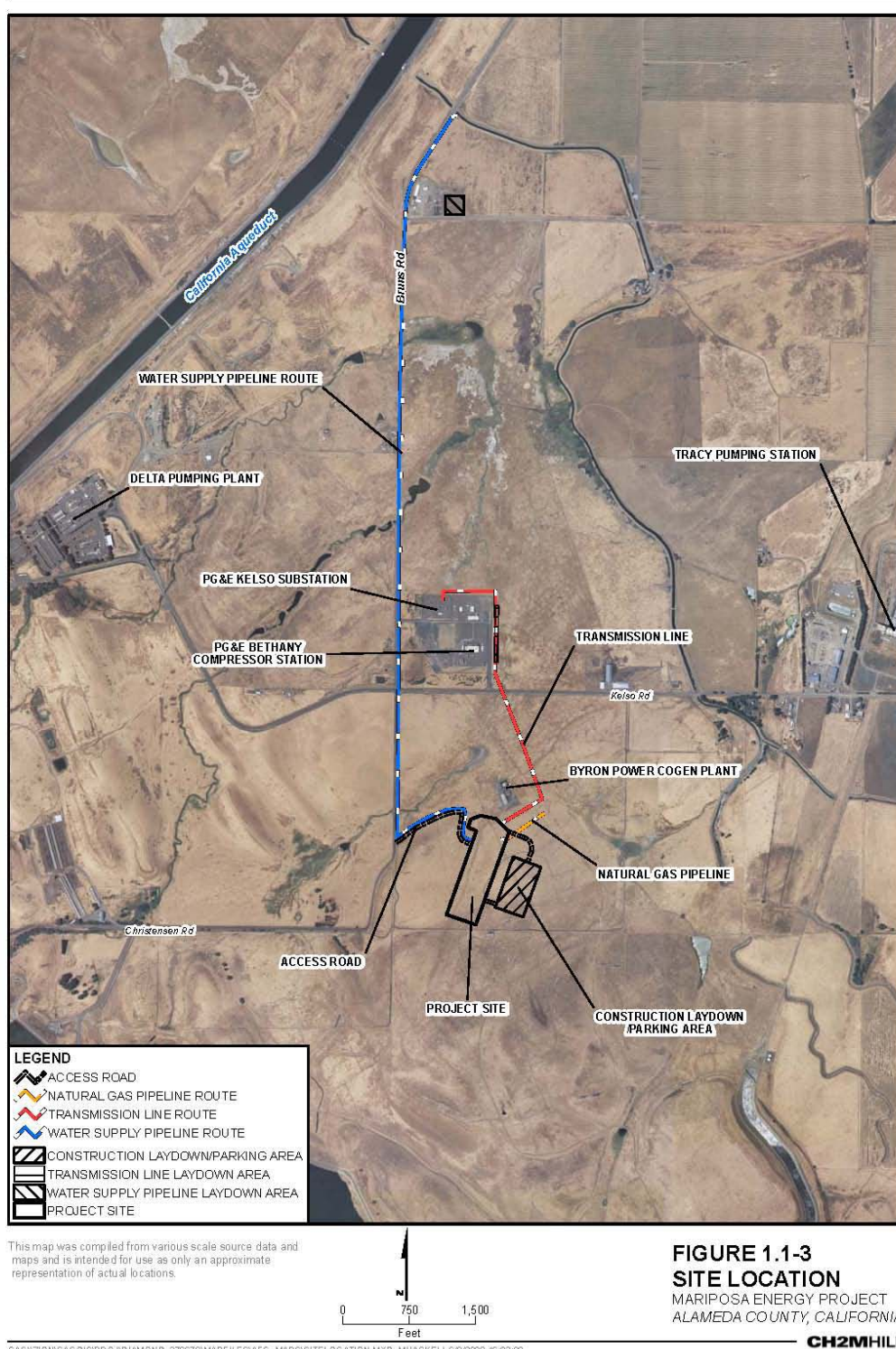


FIGURE 1.1-2
PROJECT VICINITY
 MARIPOSA ENERGY PROJECT
 ALAMEDA COUNTY, CALIFORNIA
CH2MHILL

S:\12\10\10\SAC\SIS\PROJECT\DIAMOND_376670\MAPPFILES\SAC_MAP\SWVICINITY\MAP.MXD MIHASKELL 4/20/2009 10:28:50



3.4 How The Project Will Operate:

The proposed facility will generate electric power for the grid using simple-cycle combustion turbines. The combustion turbines generate power by burning natural gas, which expands as it burns and turns the turbine blades that rotate an electrical generator to generate electricity. The main components of the system consist of a compressor, combustor, and turbine. The compressor compresses combustion air to the combustor where the fuel is mixed with the combustion air and burned. Hot exhaust gases then enter the power turbine where the gases expand across the turbine blades, rotating a shaft to power the electric generator.

After exiting the combustion turbines, the hot exhaust gases are then sent through the post-combustion emissions controls prior to being exhausted at the stack. The proposed post-combustion emissions controls consist of a Selective Catalytic Reduction (SCR) unit to reduce oxides of nitrogen in the exhaust and an oxidation catalyst to reduce organic compounds and carbon monoxide in the exhaust.

SCR injects ammonia into the exhaust stream, which reacts with the NO_x and oxygen in the presence of a catalyst to form nitrogen and water. A small amount of ammonia is not consumed in the reaction and is emitted in the exhaust stream as what is commonly called “ammonia slip”.

An oxidation catalyst oxidizes the carbon monoxide and unburned hydrocarbons in the exhaust gases to form CO₂.

The general operating scenario for each turbine is as follows:

- Operating hours per day – up to 24 hours
- Number of startups and shut downs per day – up to 12
- Operating hours per year – up to 4000
- Number of startups and shut downs per year - up to 300

Including the allowance for startup and shutdown, each turbine at this plant will be allowed to run up to 4,225 hours per year. California Code of Regulations, title 20, sections 2900, et seq., considers base-loaded generation to be “electricity generation from a powerplant that is designed and intended to provide electricity at an annualized plant capacity factor of at least 60 percent.” Annualized plant capacity factor is the ratio of electricity that is produced over the electricity that could be produced. Since each turbine will be limited to 4,000 hours of steady-state operation per year, this plant will not be a base-loaded plant.

In most years, this plant is likely to run for many fewer hours than the permit would allow. A CEC analysis shows that the actual average run time for peakers is about 600 hours per year with 200 stop and start cycles.^{4,5} The plant would likely run for longer periods in the case of sustained failure of a base-loaded plant or some other emergency.

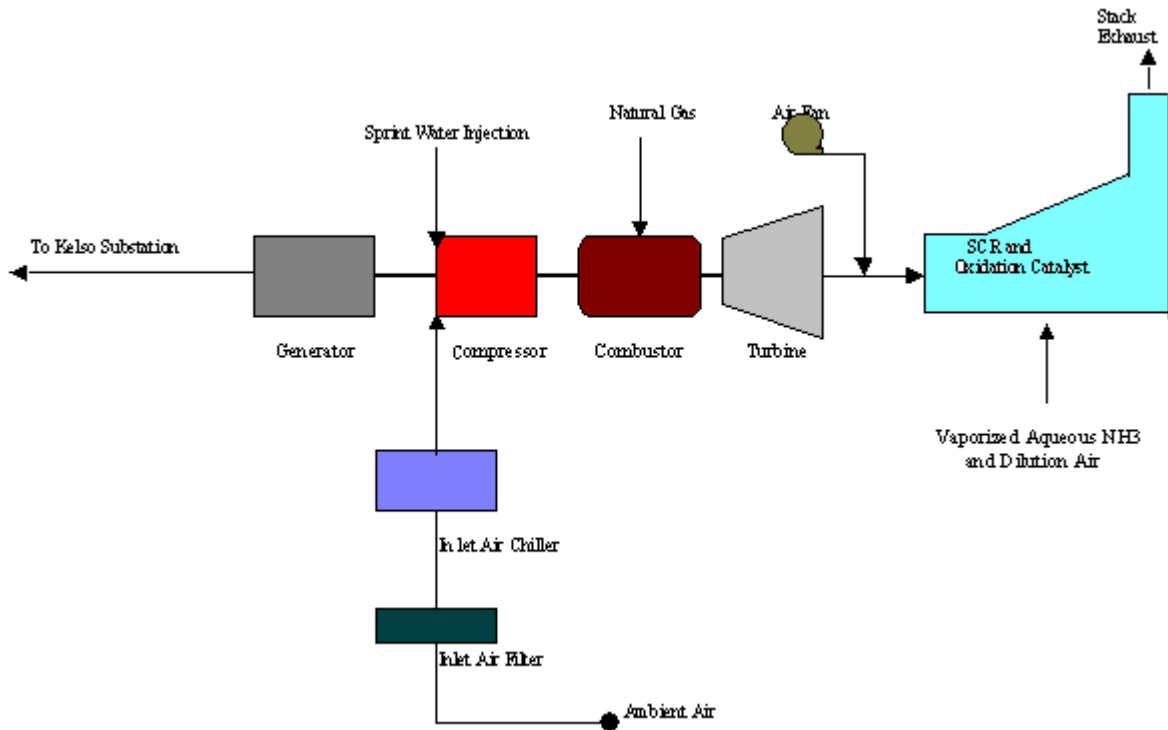
⁴ Application for Certification, Volume 1, Page 2-9, June 28, 2009

⁵ Errata to the Presiding Member’s Proposed Decision, Application for Certification for the Pastoria Energy Facility

The schematic diagram below illustrates how a simple-cycle gas turbine power plant such as the proposed Mariposa Energy Project works.

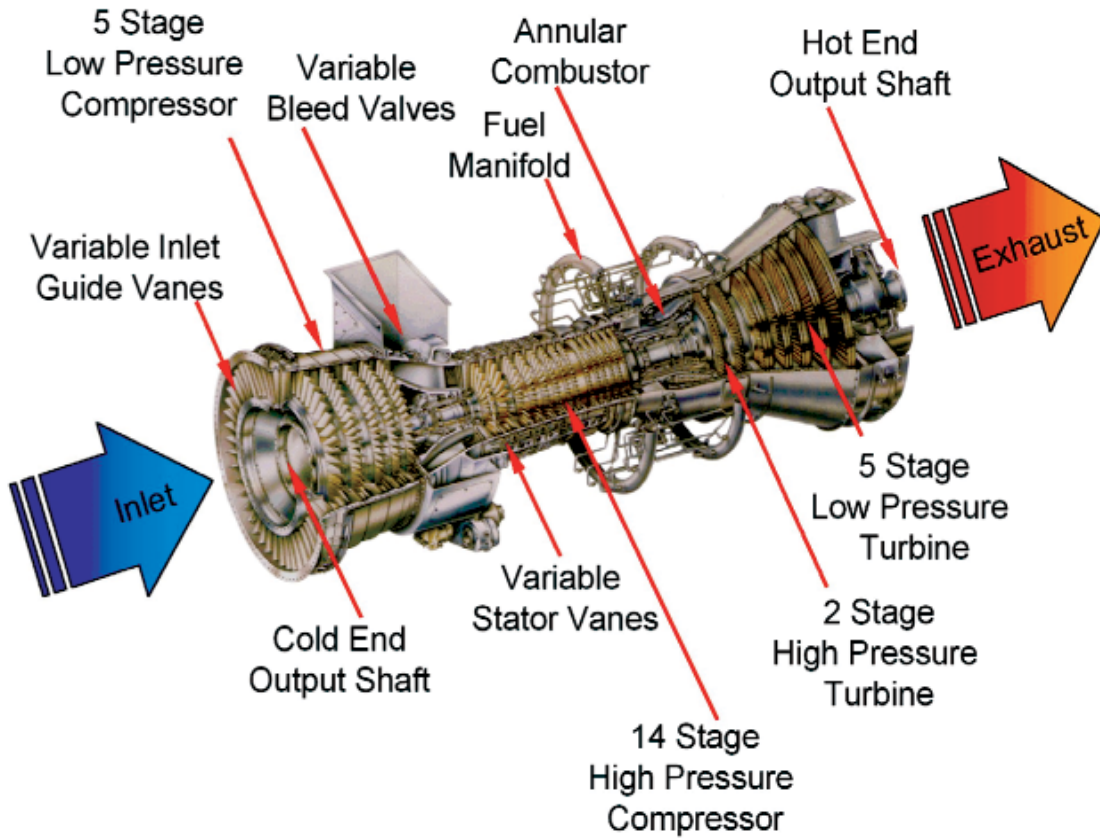
Simple-Cycle Turbine Flow Diagram:

Figure 2



Simple Cycle Turbine 3D Diagram

Figure 3



3.5 **Project Ownership:**

Mariposa Energy, LLC, will construct, own, and operate MEP. Mariposa Energy, LLC, is owned by Diamond Generating Corporation (DGC), a wholly owned subsidiary of Mitsubishi Corporation.

3.6 **Equipment Specifications**

The Mariposa Energy Project will consist of the following permitted equipment:

- S-1 Combustion Turbine Generator (CTG) #1, GE LM 6000 PC-Sprint, Natural Gas Fired, 48.5 MW, 481 MMBtu/hr maximum rated capacity (HHV); abated by A-1 Oxidation Catalyst and A-2 Selective Catalytic Reduction System (SCR).
- S-2 Combustion Turbine Generator (CTG) #2, GE LM 6000 PC-Sprint, Natural Gas Fired, 48.5 MW, 481 MMBtu/hr maximum rated capacity (HHV); abated by A-3 Oxidation Catalyst and A-4 Selective Catalytic Reduction System (SCR).
- S-3 Combustion Turbine Generator (CTG) #3, GE LM 6000 PC-Sprint, Natural Gas Fired, 48.5 MW, 481 MMBtu/hr maximum rated capacity (HHV); abated by A-5 Oxidation Catalyst and A-6 Selective Catalytic Reduction System (SCR).
- S-4 Combustion Turbine Generator (CTG) #4, GE LM 6000 PC-Sprint, Natural Gas Fired, 48.5 MW, 481 MMBtu/hr maximum rated capacity (HHV); abated by A-7 Oxidation Catalyst and A-8 Selective Catalytic Reduction System (SCR).
- S-5 Diesel Fire Pump: Make: Cummins; Model: CFP7E-F40; Model Year: TBD (2009 or later); Rated bhp: 220

4 Facility Emissions

This section describes the air pollutant emissions that the Mariposa Energy Project will have the potential to emit, as well as the principal regulatory requirements to which the equipment will be subject. Detailed emission calculations and the emission factors are presented in the appendices.

4.1 Facility Criteria Pollutant Emissions

A “criteria” air pollutant is an air pollutant that has had a National Ambient Air Quality Standard (NAAQS) established for it by the U.S. EPA. There are currently 7 criteria pollutants: sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, particulate matter less than 10 microns in diameter (PM₁₀), and particulate matter less than 2.5 microns in diameter (PM_{2.5}). Precursor organic compounds (POC) are compounds that are precursor to ozone.

4.1.1 Hourly Emissions from Gas Turbines

The Mariposa Energy Project generating equipment will have the potential to emit up to the following amounts of criteria pollutants and precursor organic compounds per hour, as set forth in Table 2. These are the maximum emission rates for these air pollutants from each turbine during normal steady-state operations, and will be limited by enforceable permit conditions.

TABLE 2. STEADY-STATE EMISSION RATES	
Pollutant	One Turbine Emission Rates (lbs/hr)
NO _x (as NO ₂)	4.4
CO	2.14
POC (as CH ₄)	0.612
PM ₁₀ /PM _{2.5}	2.5
SO _x (as SO ₂) Maximum ^a	1.35
SO _x (as SO ₂) Average ^b	0.34

^a Maximum SO_x emissions based on 1 grain sulfur per 100 scf of natural gas

^b Average SO_x emissions based on 0.25 grains sulfur per 100 scf of natural gas and an average annual firing rate of 481 MMBtu/hour.

Note that particulate matter from natural gas combustion sources normally has a diameter less than one micron.⁶ The particulate matter will therefore be both PM₁₀ (particulate matter with a diameter of less than 10 microns) and PM_{2.5} (particulate matter with a diameter of less than 2.5 microns). PM_{2.5} is a subset of particulate matter that has recently come under heightened regulatory scrutiny, and the District is in the process of developing regulations specifically directed to controlling PM_{2.5}. Those regulations are not in place yet, but for this facility the

⁶ See AP-42, Table 1.4-2, footnote c, 7/98 available at: <http://www.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf>

District's existing PM₁₀ regulations will be equally effective in controlling PM_{2.5} as well because all of the PM emissions from this facility will be both PM_{2.5} and PM₁₀.

4.1.2 Emissions During Gas Turbine Startup and Shutdown

Maximum emissions during turbine startup operations, when the turbines are at low load where they are not as efficient and when emissions control equipment may not be fully operational, are summarized in Table 3. (These operating scenarios are discussed in more detail in Sections 6.7, below.) Table 3 shows the startup emissions limits for each turbine.

TABLE 3: GAS TURBINE EMISSIONS DURING STARTUP		
Pollutant	Turbine Emission Rates for Single 30 Minutes Startup (lb/event) ^a	Maximum emissions for any hour containing a startup or shutdown
NO _x (as NO ₂)	14.2	18.5
CO	14.1	18.1
POC (as CH ₄)	1.1	1.7
PM ₁₀ /PM _{2.5}	1.25 ^b	2.5
SO _x (as SO ₂)	0.675 ^c	1.35 ^d

^a Startups not to exceed 30 minutes

^b Pounds per event for PM₁₀ are half of the PM₁₀ emissions per hour

^c Pounds per event for SO₂ are half of the maximum SO₂ emissions per hour

^d Based on maximum SO₂ emissions per hour

Maximum emissions during gas turbine shutdowns (also discussed in detail in Section 6.7) are summarized in Table 4.

TABLE 4. MAXIMUM EMISSIONS PER SHUTDOWN	
Pollutant	Turbine Shutdown Emission Rates (lb/event) ^a
NO _x (as NO ₂)	3.2
CO	2.9
POC (as CH ₄)	0.2
PM ₁₀	0.625 ^b
SO _x (as SO ₂)	0.338 ^c

^a Shutdowns not to exceed 15 minutes

^b Pounds per event for PM₁₀ is 1/4 of the PM₁₀ emissions per hour due to 15-minute shutdown

^c Pounds per event for SO₂ are 1/4 of the SO₂ emissions per hour due to 15-minute shutdown

4.1.3 Commissioning Emissions

Commissioning emissions from one simple cycle gas turbine are as shown in table 5. The following commissioning emission estimates are based on the daily maximum of 4 hours of gas turbine testing at 10% load, 8 hours of Pre-Catalyst Initial tuning at 100% load and 8 hours of Post-Catalyst tuning at 100% load.

TABLE 5. COMMISSIONING PERIOD EMISSION LIMITS FOR ONE GAS TURBINE		
Air Pollutant	Proposed Commissioning Period Emissions Limits for One Gas Turbine	
	lb/hr	lb/day
NO ₂	51	884
CO	45	589.6
POC		63.36
PM ₁₀		50
SO ₂		18.2

Note: Please check the appendix A for the detail calculations

Table 5 does not have lb/hr limits for POC, PM₁₀ and SO₂ because these pollutants are not continuously monitored for those pollutants.

The Air District is also proposing to cap the total amount of time that each turbine can operate partially abated and/or without the SCR systems and oxidation catalysts at 200 hours. This limit represents the shortest amount of time in which the facility can reasonably complete the required commissioning activities without jeopardizing safety and equipment warranties. The proposed 200-hour limit is based on the following estimates from General Electric of the time it will take for each specific commissioning activity.

TABLE 6. COMMISSIONING SCHEDULE FOR A SINGLE GAS TURBINE ₁								
Activity	Duration (hours/Day)	Days	Load Range (%)	Total Emissions				
				NO _x (lbs/hr)	CO (lb/hr)	POC (lb/hr)	SO _x ² (lb/hr)	PM ₁₀ ² (lb/hr)
Initial Load Testing and Engine Checkout ³	4	2	10%	51	45	4.48	0.91	2.5
Pre-Catalyst Initial tuning ⁴	8	9	50-100%	51	45	4.48	0.91	2.5
Post- Catalyst tuning ⁴	8	15	50-100%	34	6.2	1.2	0.91	2.5
Notes: ¹ Assumes SCR and oxidation catalyst will limit emissions to BACT levels during the final tuning period, which includes performance test. ² Steady state controlled emission rates for SO _x and PM ₁₀ are 0.91, and 2.5 lbs/hr respectively. These rates have been used to conservatively estimate hourly and total emissions during commissioning. ³ In synchronized operation followed by low load engine check. ⁴ Includes the period both before and after SCR and CO catalyst loading. Post-catalyst period includes NO _x and CO catalyst use.								

TABLE 7. COMMISSIONING SCHEDULE FOR FOUR GAS TURBINES

Activity	Duration (hours/Day)	Days	Number of Turbines	Total Emissions				
				NOx Total lbs	CO Total lb	POC Total lb	SOx ² Total lb	PM ₁₀ Total lb
Initial Load Testing and Engine Checkout ³	4	2	4	1632	1440	143	29	80
Pre-Catalyst Initial tuning ⁴	8	9	4	14688	12960	1290	262	720
Post-Catalyst tuning ⁴	8	15	4	16320	2976	576	437	1200
Total in lbs				32640	17376	2010	728	2000
Total in tons				16.3	8.7	1.0	0.36	1.0
Total Hours for 4 turbines	800							
Notes: ¹ Assumes SCR and oxidation catalyst will limit emissions to BACT levels during the final tuning period, which includes performance test. ² Steady state controlled emission rates for SOx and PM10 are 0.91, and 2.5 lbs/hr respectively. These rates have been used to conservatively estimate hourly and total emissions during commissioning. ³ In synchronized operation followed by low load engine check. ⁴ Includes the period both before and after SCR and CO catalyst loading. Post-catalyst period includes NOx and CO catalyst use.								

Compliance with the commissioning period will be monitored by continuous emissions monitors that the applicant will be required to install before any commissioning work begins, and through a written commissioning plan laying out all commissioning activities in advance, which the applicant will be required to submit to the Air District for review and approval

4.1.4 Fire Pump Emissions

The facility will have a fire pump with a Cummins 220-hp engine. The CARB certification that was submitted with the application is based on Executive Order U-R-002-0476 for Model Year 2009, Engine Family 9CEXL0409AAB.

The emission factors in the CARB Certification are shown in table 8 below:

TABLE 8. CARB CERTIFIED EMISSION FACTORS	
Pollutant	Emission Factors g/kw-hr
NO _x + POC	3.7
CO	1.6
PM ₁₀	0.17

The emission factors are converted to g/bhp-hr by multiplying by the following conversion factor: 0.746. 95% of the combined NMHC and NO_x emissions are assumed to be NO_x; the remainder is NMHC, which is equivalent to POC in this case. Therefore, the emission factors in g/bhp-hr are shown in table 9 below:

TABLE 9. EMISSION FACTORS IN G/BHP-HR	
Pollutant	Emissions Factors g/bhp-hr
NO _x	2.62
CO	1.19
POC	0.138
PM ₁₀	0.127
SO ₂ *	0.0055

Note:

* SO₂ is calculated based on the sulfur in the fuel. The sulfur content of diesel fuel is limited to 0.0015% by weight. The weight of SO₂ is about double the weight of the sulfur in the fuel. The engine will use 11.3 gal diesel fuel/hr. The density of the fuel is about 6.88 lb/gal. (Based on No. 2 fuel oil spec in attachment 3-4: Typical analyses and properties of fuel oils, APTI Course 427, Combustion Evaluation, EPA 450/2-80-063.).
SO₂: 8.09E-3 (% S in fuel oil) lb/hp-hr = 8.09E-3 (0.0015% S) (453.6 g/lb) = 0.0055 g/hp-hr

For the purposes of the risk screen analysis, the District includes only the emissions during testing and maintenance in accordance with BAAQMD Regulation 2-5-111. The hypothetical emissions during a fire are not considered. The District will allow 50 hours/yr for testing and maintenance in accordance with Section 93115.6(a)(3)(A)(1) of the CARB ATCM “Airborne Toxic Control Measure for Stationary Compression Ignition (CI) Engines” because the engine emits less than 0.15 g of PM/bhp-hr.

For the purposes of the annual potential to emit, the maximum usage is estimated at 500 hours/yr, in accordance with EPA’s memorandum of September 6, 1995, by Lydia Wegman entitled “Calculating Potential to Emit (PTE) for Emergency Generators.” This policy considers that in a year containing an emergency, an engine could run for a maximum of 500 hours.

TABLE 10. MAXIMUM DAILY AND ANNUAL REGULATED CRITERIA AIR POLLUTANT EMISSIONS FOR ENGINE					
	Nitrogen Oxides	Carbon Monoxide	Precursor Organic Compounds	Particulate Matter (PM ₁₀)	Sulfur Dioxide
	(as NO ₂)	CO	POC		SO ₂
lb/hr	1.27	0.58	0.07	0.06	0.0027
lb/day	30.48	13.89	1.68	1.44	0.06
lb/yr (50 hr/yr)*	63.50	28.95	3.50	3.00	0.14
lb/yr (500 hr/yr)**	635.00	289.45	35.00	30.0	1.35

* 50 hours is for the yearly maintenance purpose

* * 500 hours is for the yearly emergency operations

4.1.5 Daily Facility Emissions

Maximum daily emissions of regulated air pollutants emissions for the Mariposa Energy Project are set forth in Table 11 below. Table 11 shows emissions from the diesel engine and the gas turbines without startup and shutdown. Table 12 has the total emissions from the facility including startups and shutdowns.

These daily emission rates are used to determine what sources at the facility are subject to the requirement to use “Best Available Control Technology” pursuant to District New Source Review regulation (NSR; Regulation 2, Rule 2). Pursuant to District Regulation 2-2-301.1, any new source that has the potential to emit 10 pounds or more per highest day of POC, NO_x, SO₂, PM₁₀, or CO is subject to the BACT requirement for that pollutant.

TABLE 11. MAXIMUM DAILY STEADY STATE REGULATED CRITERIA AIR POLLUTANT EMISSIONS FOR FACILITY WITHOUT STARTUP/SHUTDOWN					
Source	Pollutant (lb/day)				
	Nitrogen Oxides (as NO ₂)	Carbon Monoxide CO	Precursor Organic Compounds POC	Particulate Matter (PM ₁₀)	Sulfur Dioxide SO ₂
One Unit (No Tuning)	105.6	51.4	14.7	60	32.4
Four Units (No Tuning)	422.4	205.4	58.8	240	129.6
Diesel Engine Fire Pump	30.5	13.9	1.7	1.4	0.06
Total subject to District Regulations (without Combustor Tuning)	452.9	219.3	60.5	241.4	130

TABLE 12 MAXIMUM DAILY STEADY STATE REGULATED CRITERIA AIR POLLUTANT EMISSIONS FOR FACILITY INCLUDING TWELVE 30-MINUTE STARTUPS AND TWELVE 15-MINUTE SHUTDOWNS					
Source	Pollutant (lb/day)				
	Nitrogen Oxides (as NO ₂)	Carbon Monoxide CO	Precursor Organic Compounds POC	Particulate Matter (PM ₁₀)	Sulfur Dioxide SO ₂ ^d
One Unit (No Tuning)	66.0 ^a	32.1 ^a	9.2 ^a	37.5 ^a	20.25 ^a
Four Units (No Tuning)	264	128.4	36.72	150	129.6
Diesel Engine Fire Pump	30.5	13.9	1.7	1.44	0.06
Startup	681.6 ^b	677 ^b	52.8 ^b	60 ^b	32.4 ^b
Shutdown	153.6 ^c	139.2 ^c	9.6 ^c	30 ^c	16.2 ^c
Total subject to District Regulations (without Combustor Tuning)	1130	958	101	241	130

Note: Please check appendix A for detail calculations.

^a Total hours for steady state operation: 15 hrs

^b Total hours for startup operation: 6 hrs for twelve 30-minute startups

^c Total hours for shutdown: 3 hrs for twelve 15-minute shutdowns

^d Daily SO₂ emissions based on maximum fuel sulfur content

As Table 12 shows, the gas turbines will emit over 10 pounds per day of NO_x, CO, POC, PM₁₀, and SO₂. The Fire Pump Engine will also emit over 10 pounds per day of NO_x and CO. Therefore the facility will be required to use Best Available Control Technology per Regulation 2-2-301 to limit emissions of these pollutants.

The District's analysis of the Best Available Control Technology emission limits for this equipment is described in Section 5 below.

4.1.6 Annual Facility Emissions

The maximum annual emissions of regulated air pollutants for the proposed Mariposa Energy Project are set forth in Table 13 below without startups and shutdowns. Table 14 shows the annual emissions from the facility including startups and shutdowns. Annual facility emissions are used to determine whether the facility will need to offset its emissions with Emissions Reduction Credits under District Regulations 2-2-202 and 2-2-203. Offsets are required for NO_x and POC emissions over 10 tons per year, and for PM₁₀ and SO₂ emissions over 100 tons per year.

TABLE 13. MAXIMUM ANNUAL STEADY STATE CRITERIA AIR POLLUTANT EMISSIONS FROM THE TURBINES AND DIESEL ENGINE WITHOUT STARTUP/SHUTDOWN					
	NO ₂ (ton/yr)	CO (ton/yr)	POC (ton/yr)	PM ₁₀ (ton/yr)	SO ₂ ^a (ton/yr)
One Gas Turbine ^b	8.8	4.28	1.22	5	0.68
Four Gas Turbines	35.2	17.12	4.90	20	2.72
Diesel Engine Fire Pump ^c	0.3	0.1	0.02	0.02	0.0
Total subject to District Regulations	35.5	17.2	4.9	20.0	2.7

Note: See appendices for emission calculations.

^a Annual SO₂ emissions based on average fuel sulfur content

^b Based on 4000 hours of steady-state operation per year

^c Based on 500 hours of emergency operation per year

TABLE 14. MAXIMUM ANNUAL STEADY STATE CRITERIA AIR POLLUTANT EMISSIONS FOR THE FACILITY INCLUDING STARTUP AND SHUTDOWN					
	NO ₂ (ton/yr)	CO (ton/yr)	POC (ton/yr)	PM ₁₀ (ton/yr)	SO ₂ ^c (ton/yr)
One Gas Turbine	8.8	4.28	1.22	5	0.68
Four Gas Turbines	35.2	17.12	4.88	20	2.72
Diesel Engine Fire Pump ^f	0.3	0.1	0.02	0.02	0.0
Startup	8.5	8.5	0.66	0.75 ^a	0.102 ^c
Shutdown	1.92	1.74	0.12	0.375 ^b	0.051 ^d
Total subject to District Regulations	46.0	27.5	5.7	21.1	2.9

^a PM₁₀ = 2.5 lb/hr/turbine. For 300 30-minute startups per year = (2.5/2)*300 = 375 lb/year *4 turbines = 1500 lb/year = 0.75 tpy for four turbines

^b PM₁₀ = 2.5 lb/hr/turbine. For 15 minutes per shutdown and for 300 shutdowns per year = 2.5/4 = 0.625 lb/shutdown = 0.625 * 300 = 187.5 lb/year * 4 turbines = 750 lb/year = 0.375 tpy for four turbines

^c SO₂ = 0.34 lb/hr/turbine. For 300 30-minute startups per year = (0.34/2)*300 = 51 lb/year *4 turbines = 204 lb/yr = 0.102 tpy for four turbines

^d SO₂ = 0.34 lb/hr/turbine. For 15 minutes per shutdown and for 300 shutdowns per year = (0.34/4)*300 = 25.5 lb/year * 4 turbines = 102 lb/year = 0.051 tpy for four turbines

^e Annual SO₂ emissions based on average fuel sulfur content

^f Based on 500 hours of emergency operation per year

These annual emissions rates show that the facility will be required to offset its NO_x emissions under District Regulation 2-2-302. NO_x credits, at a ratio of 1.15 tons of credits per 1 ton of emissions, are required because emissions will be over 35 tons per year. The facility will not be required to offset its POC emissions under District Regulation 2-2-302 because emissions will be less than 10 tons per year. The facility will not be required to offset its PM₁₀ and SO₂ emissions under District Regulation 2-2-303 because emissions will be less than 100 tons per year of each pollutant.

4.2 Toxic Air Contaminants

Toxic Air Contaminants (TACs) are a subset of air pollutants that can be harmful to health and the environment even in small amounts. Table 15 and Table 16 provide a summary of the maximum annual facility toxic air contaminant (TAC) emissions from the project.

TABLE 15. MAXIMUM FACILITY TOXIC AIR CONTAMINANT (TAC) EMISSIONS

	EF	Per Turbine	Per Turbine	Total for 4 Turbines	Total for 4 Turbines	Acute Risk Screening Trigger Level	Chronic Risk Screening Trigger Level
Toxic Air Contaminant	lb/MMBtu	lb/hour	lb/year	lb/hour	lb/year	(lb/hr)	(lb/yr)
1,3-Butadiene	0.00000012	0.000060	0.258	0.00024	1.0307	None	0.63
Acetaldehyde	0.00013431	0.064645	277.974	0.25858	1111.8974	1	38
Acrolein	0.00001853	0.008918	38.348	0.03567	153.3931	0.0055	14
Ammonia	0.00680000	3.272840	14073.212	13.09136	56292.8480	7.1	7700
Benzene	0.00001304	0.006276	26.986	0.02510	107.9433	2.9	3.8
Benzo(a)anthracene	0.00000002	0.000011	0.046	0.00004	0.1834	None	None
Benzo(a)pyrene	0.00000001	0.000007	0.028	0.00003	0.1128	None	0.0069
Benzo(b)fluoranthene	0.00000001	0.000005	0.023	0.00002	0.0917	None	None
Benzo(k)fluoranthene	0.00000001	0.000005	0.022	0.00002	0.0893	None	None
Chrysene	0.00000002	0.000012	0.051	0.00005	0.2045	None	None
Dibenz(a,h)anthracene	0.00000002	0.000011	0.048	0.00004	0.1907	None	None
Ethylbenzene	0.00001755	0.008446	36.319	0.03379	145.2771	None	43
Formaldehyde	0.00045000	0.216585	931.316	0.86634	3725.2620	0.21	18
Hexane	0.00025392	0.122212	525.514	0.48885	2102.0542	None	270000
Indeno(1,2,3-cd)pyrene	0.00000002	0.000011	0.048	0.00004	0.1907	None	None
Naphthalene	0.00000163	0.000783	3.368	0.00313	13.4726	None	None
Propylene	0.00075588	0.363806	1564.367	1.45522	6257.4662	None	120000
Propylene Oxide	0.00004686	0.022555	96.987	0.09022	387.9467	6.8	29
Toluene	0.00006961	0.033502	144.060	0.13401	576.2388	82	12000
Xylene (Total)	0.00002559	0.012316	52.957	0.04926	211.8286	49	27000
Sulfuric Acid Mist (H2SO4)	0.00058950	0.283550	1197.997	1.1342	4791.9866	0.26	39
Benzo(a)pyrene equivalents	0.0000000448	0.000022	0.093	0.00009	0.3706	None	0.0069
PAH	0.001132	0.000062	0.266	0.00025	1.0632	None	None

Notes: PAH impacts are evaluated as Benzo (a) pyrene equivalents.
Based on total fuel input of 481 MMBtu/hr

Equivalency
PAHs
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Chrysene

Factor
0.1
1.0
0.1
0.1
0.01

Dibenz(a,h)anthracene	1.05
Indeno(1,2,3-cd)pyrene	0.1

TABLE 16 DIESEL ENGINE TOXIC AIR CONTAMINANT (TAC) EMISSIONS						
Source	PM ₁₀ in g/bhp-hr	BHP	For 50 hours PM ₁₀ in lb/yr	For 500 hours PM ₁₀ in lb/yr	Acute Risk Screening Trigger Level lb/hr	Chronic Risk Screening Trigger Level lb/hr
S-5	0.127	220	3.07	30.07	None	0.63

Table 15 and Table 16 are also used as input data for air pollutant dispersion models used to assess the increased health risk to the public resulting from the project. The ammonia emissions shown are based upon a worst-case ammonia emission concentration of 5 ppmvd @ 15% O₂ from the gas turbine SCR systems. The chronic and acute screening trigger levels shown are per Table 2-5.1 of Regulation 2, Rule 5.

If emissions are above certain established screening levels prescribed in Table 2-5-1 of Regulation 2, Rule 5, a health risk assessment is required. Where no acute trigger level is listed for a TAC, none has been established for that TAC. Based on the information contained in Table 12 a health risk assessment is required by District Regulation 2, Rule 5. The health risk assessment is conducted to determine the potential impact on public health resulting from the worst-case TAC emissions from the project.

The results of the health risk assessment are discussed in full in Section 8 of this document. Briefly, the health risk assessment found a maximum increased cancer risk of 0.3 in one million for the maximally exposed resident near the facility and 1.3 in one million for the maximally exposed worker near the facility. The highest chronic non-cancer hazard index for the project is 0.015 and the highest acute non-cancer hazard index for the project is 0.026. These non-cancer risks are less than significant under District Regulation 2, Rule 5, because they are less than 1.0 in a million.

4.3 Hazardous Air Pollutants

Hazardous air pollutants (HAPs) are hazardous pollutants that are listed in Section 112(b) of the Federal Clean Air Act. Not all of the pollutants that are designated as toxic air contaminants by BAAQMD Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants, are considered to be “112(b)” pollutants by Federal EPA. Three notable pollutants that are TACs and not HAPs are ammonia, hydrogen sulfide, and sulfuric acid mist.

TABLE 17. MAXIMUM FACILITY HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS		
Hazardous Air Pollutant	Project lb/year	Project ton/year
1,3-Butadiene	1.0307	< 1.0
Acetaldehyde	1111.8900	< 1.0
Acrolein	153.3930	< 1.0
Benzene	107.9430	< 1.0
Benzo(a)anthracene	0.1834	< 1.0
Benzo(a)pyrene	0.1128	< 1.0
Benzo(b)fluoranthene	0.0917	< 1.0
Benzo(k)fluoranthene	0.0893	< 1.0
Chrysene	0.2045	< 1.0
Dibenz(a,h)anthracene	0.1907	< 1.0
Ethylbenzene	145.2770	< 1.0
Formaldehyde	3725.2600	1.86
Hexane	2102.0500	1.05
Indeno(1,2,3-cd)pyrene	0.1907	< 1.0
Naphthalene	13.4726	< 1.0
Propylene Oxide	387.9460	< 1.0
Toluene	576.2380	< 1.0
Xylene (Total)	211.8280	< 1.0
Benzo(a)pyrene equivalents	0.3706	< 1.0
Total: lb/yr	8537.7622	
Total: ton/yr	4.27	

The purpose for summing the hazardous air pollutants is to determine whether a facility is major for hazardous air pollutants as defined by BAAQMD Regulation 2, Rule 6, which states that a facility is major if it emits more than 10 tons/year of any hazardous air pollutant and more than 25 tons/year of a combination of hazardous air pollutants.

4.4 Greenhouse Gas Emissions

The greenhouse gases have been estimated on the following basis:

- Fuel usage of 481 MMbtu/hr of natural gas/turbine/hr
- 4225 hours of operation/turbine/yr
- Fuel usage of 11.3 gal of diesel fuel/hr for engine
- 500 hours of operation/yr for engine
- SF6: 150 lbs in one circuit breaker; 0.1% leak rate

TABLE 18. ESTIMATED ANNUAL GHG EMISSIONS FROM MEP

	Fuel Usage, MMbtu/yr	Emission Factor, (kg CO2/MMbtu)	Emission Factor, (g CH4/MMbtu)	Emission Factor, (g N2O/MMbtu)	GHG (metric tons/yr)	Global Warming Potential	CO2 Equivalents (Metric tons/yr)
GHG							
Gas Turbines							
CO2	8,128,900	52.87	0.9	0.1	429775	1	429775
CH4	8,128,900				7	21	154
N2O	8,128,900				1	310	252
Engine	Fuel Usage, gal/yr, @ 500 hr/yr	Emission Factor, (kg CO2/gal)					
CO2	5,650	10.14	0.000416	0.000083	57	1	57
CH4	5,650				0.0000	21	0
N2O	5,650				0.0000	310	0
Circuit Breakers							
SF6					0.000075	23,900	2
Total							430240

Note:

Emission Factors from the REGULATION FOR THE MANDATORY REPORTING OF GREENHOUSE GAS EMISSIONS, Appendix A, Title 17, California Code of Regulations, Subchapter 10, Article 2, Sections 95100 to 95133

CO2 Emission Factor from Table 4 Appendix A-6 for Natural Gas with a heat content between 1000 Btu/scf and 1025 Btu/scf

CH4 Emission Factor from Table 6 Appendix A-9

N2O Emission Factor from Table 6 Appendix A-9

Global Warming Potentials from Table 2 Appendix A-4

Applicant estimates SF6 emissions for 1 circuit breaker at 0.15 lb/yr per unit (based on 0.1% leak rate for 150 lb SF6 per unit). Circuit breaker is hermetically sealed per applicant.⁷

⁷ Email of July 13th, 2010 from Keith McGregor to Brenda Cabral

5 Best Available Control Technology (BACT)

The District's New Source Review regulations require the proposed Mariposa Energy Project to utilize the "Best Available Control Technology" ("BACT") to minimize air emissions, as discussed in more detail below. This section describes how the BACT requirements will apply to the facility.

5.1 Introduction

District Regulation 2-2-301 requires that the Mariposa Energy Project use the Best Available Control Technology to control NO_x, CO, POC, PM₁₀, and SO_x emissions from sources that will have the potential to emit over 10 pounds per highest day of each of those pollutants. Pursuant to Regulation 2-2-206, BACT is defined as the more stringent of:

- (a) "The most effective control device or technique which has been successfully utilized for the type of equipment comprising such a source; or
- (b) The most stringent emission limitation achieved by an emission control device or technique for the type of equipment comprising such a source; or
- (c) Any emission control device or technique determined to be technologically feasible and cost-effective by the APCO, or
- (d) The most effective emission control limitation for the type of equipment comprising such a source which the EPA states, prior to or during the public comment period, is contained in an approved implementation plan of any state, unless the applicant demonstrates to the satisfaction of the APCO that such limitations are not achievable. Under no circumstances shall the emission control required be less stringent than the emission control required by any applicable provision of federal, state or District laws, rules or regulations."

The type of BACT described in definitions (a) and (b) must have been demonstrated in practice and is referred to as "BACT 2". This type of BACT is termed "achieved in practice". The BACT category described in definition (c) is referred to as "technologically feasible/cost-effective" and it must be commercially available, demonstrated to be effective and reliable on a full-scale unit, and shown to be cost-effective on the basis of dollars per ton of pollutant abated. This is referred to as "BACT 1". BACT specifications (for both the "achieved in practice" and "technologically feasible/cost-effective" categories) for various source categories have been compiled in the BAAQMD BACT Guideline.

The simple-cycle turbines are subject to BACT under the District's New Source Review regulations (Regulation 2, Rule 2, Section 301) for NO_x, CO, POC, PM₁₀, and SO_x because each unit will have the potential to emit more than 10 pounds per highest day of those pollutants.

The fire pump engine, S5, is subject to BACT under the District's New Source Review regulations (Regulation 2, Rule 2, Section 301) for NO_x and CO because the engine will have the potential to emit more than 10 pounds per highest day of those pollutants.

The following sections provide the basis for the District BACT analyses for this equipment.

5.2 Best Available Control Technology for Oxides of Nitrogen (NO_x) for Turbines

Oxides of Nitrogen (NO_x) are a byproduct of the combustion of an air-and-fuel mixture in a high-temperature environment. NO_x is formed when the heat of combustion causes the nitrogen molecules in the combustion air to dissociate into individual nitrogen atoms, which then combine with oxygen atoms to form nitric oxide (NO) and nitrogen dioxide (NO₂). This reaction primarily forms NO (95% to 98%) and only a small amount of NO₂ (2% to 5%), but the NO eventually oxidizes and converts to NO₂ in the atmosphere. NO₂ is a reddish-brown gas with a detectable odor at very low concentrations. NO and NO₂ are generally referred to collectively as "NO_x".⁸ NO_x is a precursor to the formation of ground-level ozone, the principal ingredient in smog.

The District has examined technologies that may be effective to control NO_x emissions in two general areas: combustion controls that will minimize the amount of NO_x created during combustion; and post-combustion controls that can remove NO_x from the exhaust stream after combustion has occurred.

Combustion Controls

The formation of NO_x during combustion is highly dependent on the primary combustion zone temperature, as the formation of NO_x increases exponentially with temperature. There are therefore three basic strategies to reduce thermal NO_x in the combustion process:

- Reduce the peak combustion temperature
- Reduce the amount of time the air/fuel mixture spends exposed to the high combustion temperature
- Reduce the oxygen level in the primary combustion zone

It should be noted, however, that techniques that control NO_x by reducing combustion temperatures might involve a trade-off with the formation of other pollutants. Reducing combustion temperatures to limit NO_x formation can decrease combustion efficiency, resulting in increased byproducts of incomplete combustion such as carbon monoxide and unburned

⁸ NO_x can also be formed when a nitrogen-bound hydrocarbon fuel is combusted, resulting in the release of nitrogen atoms from the fuel (fuel NO_x) and NO_x can be formed by organic free radicals and nitrogen in the earliest stages of combustion (prompt NO_x). Natural gas does not contain significant amounts of fuel-bound nitrogen, therefore thermal NO_x is the primary formation mechanism for natural gas fired gas turbines. References to NO_x formation during combustion in this analysis refer to "thermal NO_x", NO_x formed from nitrogen in the combustion air.

hydrocarbons. (Unburned hydrocarbons from natural gas combustion consist of methane, ethane and precursor organic compounds.)

The District prioritizes NO_x reductions over carbon monoxide, however, because the Bay Area is not in compliance with applicable ozone standards, but does comply with carbon monoxide standards. The District therefore requires applicants to minimize NO_x emissions to the greatest extent feasible, and then to optimize CO and POC emissions for that level of NO_x control. This is a trade-off that must be kept in mind when selecting appropriate emissions control technologies for these pollutants.

The District has identified the following available combustion control technologies for reducing NO_x emissions from the combustion turbines.

Steam/Water Injection: Steam or water injection was one of the first NO_x control techniques utilized on gas turbines. Water or steam is injected into the combustion zone to act as a heat sink, lowering the peak flame temperature and thus lowering the quantity of thermal NO_x formed. The injected water or steam exits the turbine as part of the exhaust. The lower peak flame temperature can also reduce combustion efficiency and prevent complete combustion, however, and so carbon monoxide and POC emissions can increase as water/steam-to-fuel ratios increase. In addition, the injected steam or water may cause flame instability and can cause the flame to quench (go out). Water/steam injection in the combustion turbines can achieve NO_x emissions as low as 25 ppm @ 15% O₂.

Dry Low-NO_x Combustors: Another technology that can control NO_x without water/steam injection is Dry Low-NO_x combustion technology. Dry Low-NO_x Combustors reduce the formation of thermal NO_x through (1) “lean combustion” that uses excess air to reduce the primary combustion temperature; (2) reduced combustor residence time to limit exposure in a high temperature environment; (3) “lean premixed combustion” that reduces the peak flame temperature by mixing fuel and air in an initial stage to produce a lean and uniform fuel/air mixture that is delivered to a secondary stage where combustion takes place; and/or (4) two-stage rich/lean combustion using a primary fuel-rich combustion stage to limit the amount of oxygen available to combine with nitrogen and then a secondary lean burn-stage to complete combustion in a cooler environment. Dry Low-NO_x combustors can achieve NO_x emissions as low as 9 ppm.

Catalytic Combustors: Catalytic combustors, marketed under trade names such as XONON™, use a catalyst to allow the combustion reaction to take place with a lower peak flame temperature in order to reduce thermal NO_x formation. XONON™ uses a flameless catalytic combustion module followed by completion of combustion (at lower temperatures) downstream of the catalyst. Catalytic combustors such as XONON™ have not been demonstrated on Aero-derivative simple-cycle gas turbines such as the GE LM 6000 PC Sprint or Siemens F Class. The technology has been successfully demonstrated in a 1.5-megawatt simple-cycle pilot facility, and it is commercially available for turbines rated up to 10 megawatts, but it is not currently available for turbines of the size proposed for the Mariposa Energy Project.

Post-Combustion Controls

The District has identified the following post-combustion controls that can remove NO_x from the emissions stream after it has been formed.

Selective Catalytic Reduction (SCR): Selective catalytic reduction injects ammonia into the exhaust stream, which reacts with the NO_x and oxygen in the presence of a catalyst to form nitrogen and water. NO_x conversion is sensitive to exhaust gas temperature, and performance can be limited by contaminants in the exhaust gas that may mask or poison the catalyst. A small amount of ammonia is not consumed in the reaction and is emitted in the exhaust stream as what is commonly called “ammonia slip”. The SCR catalyst requires replacement periodically. SCR is a widely used post-combustion NO_x control technique on gas turbines, usually in conjunction with combustion controls.

Selective non-catalytic reduction (SNCR): Selective non-catalytic reduction involves injection of ammonia or urea with proprietary conditioners into the exhaust gas stream without a catalyst. SNCR technology requires gas temperatures in the range of 1400° to 2100° F⁹ and is most commonly used in boilers because combustion turbines do not have exhaust temperatures in that range. Selective non-catalytic reduction (SNCR) requires a temperature window that is higher than the exhaust temperatures from utility combustion turbine installations.

EMx™: EMx™ (formerly SCONOX™) is a catalytic oxidation and absorption technology that uses a two-stage catalyst/absorber system for the control of NO_x, CO, VOC and optionally SO_x emissions for gas turbine applications. A coated catalyst oxidizes NO to NO₂, CO to CO₂, and VOCs to CO₂ and water, and the NO₂ is then absorbed onto the catalyst surface where it is chemically converted to and stored as potassium nitrates and nitrites. A proprietary regenerative gas is periodically passed through the catalyst to desorb the NO₂ from the catalyst and reduce it to elemental nitrogen (N₂). The EMx™ process uses no ammonia. The EMx™ catalyst requires replacement periodically. EMx™ has been successfully demonstrated on several small combined-cycle combustion turbine projects up to 45 megawatts. The District is not aware of any EMx™ installations for simple-cycle gas turbines or peaking units.

Proposed BACT for NO_x for Simple-Cycle Gas Turbines

Combustion Controls

Based on the preceding discussion, water-injection and dry low-NO_x combustion are both technically feasible simple-cycle combustion turbine control technologies that are available to control NO_x emissions. As part of the turbine selection process, the turbine vendor provided performance data for water-injected LM 6000 PC Sprint, dry-low NO_x LM 6000 PD Sprint gas turbines and dry-low NO_x LM 6000PF Sprint gas turbines (See Table 1). Although the LM 6000 PD turbine would have a similar NO_x emission rate and the PF turbine would have a lower NO_x emission rate than the PC turbine, the DLE models would have higher hydrocarbon and CO emission rates generally (except at the 17°F temperature case) when compared to the water-

⁹ NSCR discussion is from Institute of Clean Air Companies website:
www.icac.com/i4a/pages/index.cfm?pageID=3399

injected PC turbine. The applicant considered this tradeoff in the selection of the PC turbine, taking into account that any turbine selected would have to meet a 2.5-ppm NO_x BACT limit utilizing post combustion technology.

The applicant has proposed the use of water-injection as BACT for the simple-cycle gas turbines. Water-injection is technologically feasible and commonly used at facilities of this type. This emissions control technology therefore satisfies the District's BACT requirement for combustion controls.

Post-Combustion Controls

The applicant has proposed the use of Selective Catalytic Reduction (SCR) as BACT for the simple-cycle gas turbines.

Selective Catalytic Reduction (SCR) and EM_x can achieve NO_x emissions of 2.5 ppm for simple-cycle turbines. These are the most effective level of controls that can be achieved by post combustion controls. EM_xTM technology was first installed at the Redding Power Plant Unit #5, a 45-MW combined-cycle facility in Shasta County, California. The Shasta County Air Quality Management District evaluated EM_xTM at that facility under a demonstration NO_x limit of 2.0 ppm (equivalent to what SCR can achieve for a combined-cycle unit).

After three years of operation, the Shasta County AQMD evaluated whether the facility was meeting this demonstration limit with EM_xTM, and concluded that "Redding Power is not able to reliably and continuously operate while maintaining the NO_x demonstration limit of 2.0 ppmvd @ 15% O₂." Based on Shasta County's negative experience with Redding Power, the District decided to accept SCR as a NO_x control technology.

In addition to NO_x, the District also compared the potential ancillary environmental impacts inherent in SCR and EM_xTM to determine whether EM_xTM should be considered more "effective" for purposes of the BACT analysis. In particular, the District evaluated the potential impacts from ammonia emissions that would occur from using SCR. The use of SCR will result in ammonia emissions because some of the ammonia used in the reaction to convert NO_x to nitrogen and water does not get reacted and remains in the exhaust stream. The excess or unreacted ammonia emissions are known as "ammonia slip". Ammonia is a toxic chemical that can irritate or burn the skin, eyes, nose, and throat, and it also has the potential for reacting with nitric acid under certain atmospheric conditions to form particulate matter (Secondary PM).

With respect to the potential toxic impacts from ammonia slip emissions, the District has conducted a health risk assessment using air dispersion modeling to evaluate the potential health impacts of all toxics emissions from the facility, including ammonia slip. This assessment showed an acute hazard index of 0.026 and a chronic hazard index of 0.015. (See Health Risk Assessment in the Appendices.) A hazard index under 1.0 is considered less than significant. This minimal additional toxic impact of the ammonia slip resulting from the use of SCR is not significant and is not a sufficient reason to eliminate SCR as a control alternative.

The District also considered the potential environmental impact that may result from the use of SCR involves ammonia transportation and storage. The proposed facility will utilize aqueous

ammonia in a 19% (by weight) solution for SCR ammonia injection, which will be transported to the facility and stored on-site in tanks. The transportation and storage of ammonia presents a risk of an ammonia release in the event of a major accident. These risks will be addressed in a number of ways under safety regulations and sound industry safety codes and standards. These safety measures include the Risk Management Plan requirement pursuant to the California Accidental Release Prevention Program, which must include an off-site consequences analysis and appropriate mitigation measures; a requirement to implement a Safety Management Plan (SMP) for delivery of ammonia and other liquid hazardous materials; a requirement to instruct vendors delivering hazardous chemicals, including aqueous ammonia, to travel certain routes; a requirement to install ammonia sensors to detect the occurrence of any potential migration of ammonia vapors offsite; a requirement to use an ammonia tank that meets specific standards to reduce the potential for a release event; and a requirement to conduct a “Vulnerability Assessment” to address the potential security risk associated with storage and use of aqueous ammonia onsite. With these safeguards in place, the risks from catastrophic ammonia releases from SCR systems can be mitigated to a less than significant level. The Energy Commission will also be evaluating these risks further through its CEQA-equivalent environmental review process and will impose mitigating conditions as necessary to ensure that the risks are less than significant. For all of these reasons, the potential environmental impact from aqueous ammonia transportation and storage does not justify the elimination of SCR as a control alternative.

Finally, the District also evaluated the potential for ammonia slip to have ancillary impacts on secondary particulate matter. Secondary particulate matter in the Bay Area is mostly ammonium nitrate.¹⁰ The District has historically believed that ammonia was not a significant contributor to secondary particulate matter because the Bay Area is “nitric-acid limited”. This means that the formation of ammonium nitrate is constrained by the amount of nitric acid in the atmosphere and not driven by the amount of ammonia in the atmosphere. Where an area is nitric acid limited, emissions of additional ammonia will not contribute to secondary particulate matter formation because there is not enough nitric acid for it to react with.

The District has recently started reconsidering the extent to which this situation is correct, however. This further evaluation has generally confirmed (preliminarily at least) that the Bay Area is in fact nitric acid limited, although it has shown that secondary particulate formation mechanisms are highly complex and that the District’s historical assumptions that ammonia emissions play no role whatsoever in secondary PM formation may, in hindsight, have been overly simplistic. The focus of the District further evaluation has been a computer modeling exercise designed to predict what PM_{2.5} levels will be around the Bay Area, given certain assumptions about emissions of PM_{2.5} and its precursors, about regional atmospheric chemistry, and about prevailing meteorological conditions. This information was used to create a computer model of regional PM_{2.5} formation in the Bay Area from which predictions can be drawn about how emissions of PM_{2.5} precursors will impact regional ambient PM_{2.5} concentrations. The District’s report on its computer modeling exercise has not been finalized, but the draft report

¹⁰ See BAAQMD, Draft Report, *Fine Particulate Matter Data Analysis and Modeling in the Bay Area* (Draft, Oct. 1, 2009), at p. 8 (Draft PM_{2.5} Modeling Report). The Air District anticipates issuing a final report in the near future.

concludes that regional ammonium nitrate buildup is limited by nitric acid, not by ammonia.¹¹ The draft report does find that the amount of available nitric acid is not uniform but varies in different locations around the Bay Area, and consequently the potential for ammonia emissions to impact PM_{2.5} formation varies around the Bay Area. Specifically, according to the draft report, the model predicts that a reduction of 20% in total ammonia emissions throughout the Bay Area would result in changes in ambient PM_{2.5} levels of between 0% and 4%, depending on the availability of nitric acid, leaving open the potential that ammonia restrictions could form a useful part of a regional strategy to reduce PM_{2.5}.¹² The draft report therefore restates the general conclusion that the Bay Area is nitric acid limited, although it finds that reductions in the region's ammonia inventory could potentially achieve reductions in PM_{2.5} concentrations in areas that may have sufficient available nitric acid.¹³ (The draft report cautions that its assumptions regarding the availability of nitric acid may be misleading, however, because of the preliminary nature of the ammonia emissions inventory used for modeling.) Notably, the model also predicts that the Byron area where the facility would be located has low levels of available nitric acid, in the vicinity of 0.30 ppb.¹⁴

The District does not believe that these indications from its draft PM_{2.5} data and modeling analysis provide a sufficient basis to disqualify SCR as a BACT technology at Mariposa based on its potential for ammonia slip emissions. As the report itself notes, the District's work in this area is still at a preliminary stage and it is difficult to draw any firm conclusion about secondary PM formation from it at this time. Moreover, secondary particulate formation is a highly complex atmospheric process, making it especially difficult to estimate how a specific facility's ammonia slip emissions might impact ambient PM levels. The District therefore notes the results of its recent work on secondary particulate matter and will be conducting additional work in this area going forward, but has concluded that there is not enough conclusive evidence at this stage that this facility could have a significant particulate matter impacts because of ammonia slip emissions from the SCR system.

In addition, the District notes that secondary PM formation from ammonia slip is a cold weather phenomenon that occurs only in the winter. This is because ammonium nitrate volatilizes at higher temperatures and only exists in a particulate phase in cold weather¹⁵. Moreover, the times when the Bay Area experiences problems with high ambient PM levels in the air are during the winter months (primarily November through February). The Mariposa Energy Project will be a peaker plant, however, which operates during periods of peak demand, which normally occur during the hot summer months, when air conditioning use is heavy.

The District therefore concludes that potential secondary PM formation from ammonia slip would not be a significant concern at Mariposa Energy Project because the facility will operate

¹¹ Draft PM_{2.5} Modeling Report at p. E-3 & p. 30

¹² Draft PM_{2.5} Modeling Report at pp. E-3 – E-4

¹³ Draft PM_{2.5} Modeling Report at p. 30

¹⁴ Draft PM_{2.5} Modeling Report, Figure 17, p. 31

¹⁵ Draft PM_{2.5} Modeling Report at p. 10 (For all of the above notes, please check following link.)

http://www.baaqmd.gov/~media/Files/Engineering/Public%20Notices/2010/18404/Footnotes/PM-data-analysis-and-modeling-report_DRAFT.ashx

primarily in weather conditions where ammonium nitrate secondary PM cannot form, and at times of the year when PM pollution is less of a concern.

Finally, the District also notes that although the manufacturer claims that EMx™ can be effectively scaled up from the smaller turbines on which it has demonstrated to the larger turbines at the proposed Mariposa Energy Project, earlier attempts to demonstrate the technology in practice have not been without problems. For example, the first attempt to scale the technology up from very small turbines (~5 MW) to the 50-MW range was at the Redding Power Plant Unit #5, a 45-MW combined-cycle facility in Shasta County, CA. The Shasta County Air Quality Management District evaluated EMx™ at that facility under a demonstration NO_x limit of 2.0 ppm (equivalent to what SCR can achieve for a combined-cycle unit).

After three years of operation, the Shasta County AQMD evaluated whether the facility was meeting this demonstration limit with EMx™, and concluded that “Redding Power is not able to reliably and continuously operate while maintaining the NO_x demonstration limit of 2.0 ppmvd @ 15% O₂.”¹⁶

These concerns would be further compounded by the fact that Mariposa Energy Project will be a simple-cycle peaker plant, not a combined-cycle or cogeneration facility like other facilities where EMx™ has been installed. The EMx™ requires steam as part of the catalyst regeneration process. Unlike combined-cycle and cogeneration facilities, simple-cycle facilities like Mariposa Energy Project do not have any steam production. And there is an additional concern involving the damper systems that would be required with EMx™ to ensure proper regeneration gas distribution. Peaker plants require more rapid startups and more frequent load changes than combined-cycle and cogeneration plants, and to the District’s knowledge the effectiveness and longevity of these damper systems has not been demonstrated under these conditions.

Given the uncertainties that still remain in understanding how secondary PM formation is impacted by ammonia slip, the significant additional cost that would be necessary to implement EMx™, and the concern that scaling EMx™ up to fit this facility could involve significant implementation problems, the District has concluded that EMx™ should not be required here as a BACT technology.

Based on this review, the District has concluded that SCR meets the District’s BACT requirement. The proposed project would therefore comply with BACT for NO_x.

Determination of BACT emissions limit for NO_x for Simple-Cycle Gas Turbines

The District is also proposing to establish a BACT emissions limit in the permit of 2.5 ppm (averaged over one hour), which is the most stringent limit that has been achieved in practice at any other similar facility and is the most stringent limit that would be technologically feasible.

¹⁶ Letter from R. Bell, Air Quality District Manager, Shasta County Air Quality Management District, to R. Bennett, Safety & Environmental Coordinator, Redding Electric Utility, June 23, 2005

To determine the most stringent emissions limit that has been achieved in practice, the District evaluated other similar simple-cycle natural gas fired turbines. Common simple-cycle gas turbine units proposed for use for intermediate peaking and peaking power in California are General Electric LMS-100 gas turbines (100 MW), and LM6000 (48.5 MW) gas turbines. LMS-100 gas turbines operate in a similar fashion and are appropriate for comparison with this facility. Numerous projects have been permitted with the LMS-100 gas turbines. The LM6000 gas turbines have also been installed at numerous sites across the state to provide peaking power.

The District reviewed the NO_x emission limits of power plants using large turbines in a simple-cycle mode abated by SCR systems. The District also reviewed BACT determinations at the EPA RACT/BACT/LAER Clearinghouse, ARB BACT Clearinghouse and recent projects undergoing CEC licensing. Some of the LMS100 simple-cycle gas turbine permits and LM6000 simple-cycle gas turbine permits with NO_x limits are shown in the Table 18 below.

TABLE 19. NO_x EMISSION LIMITS FOR LARGE SIMPLE-CYCLE POWER PLANTS USING SCR	
Facility	NO_x (ppmvd @ 15% O₂)
Los Esteros Critical Energy Center, BAAQMD GE LM6000 Gas Turbines, 48.5 MW each	5.0 (3-hr)
Panoche Energy Center, SJVAPCD GE LMS100 Gas Turbines, 100 MW each	2.5 (1-hr)
Walnut Creek Energy Park, SCAQMD GE LMS100 Gas Turbines, 100 MW each	2.5 (1-hr)
Sun Valley Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	2.5 (1-hr)
CPV Sentinel Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	2.5 (1-hr)
Lambie Energy Center, BAAQMD GE LM6000 Gas Turbines, 48.5 MW each	2.5 (1-hr)
Riverview Energy Center, BAAQMD GE LM6000 Gas Turbines, 48.5 MW each	2.5 (1-hr)
Wolfskill Energy Center, BAAQMD GE LM6000 Gas Turbines, 48.5 MW each	2.5 (1-hr)
Goosehaven Energy Center, BAAQMD GE LM6000 Gas Turbines, 48.5 MW each	2.5 (1-hr)

As the Table 19 shows, emissions of 2.5 ppm NO_x averaged over 1-hour is the most stringent emission limitation that has been determined to be achievable at any similar facility using SCR for NO_x control.

The District examined only simple-cycle turbines in this review because simple-cycle turbines operate differently than combined-cycle turbines and cannot achieve the same NO_x emissions performance as combined-cycle turbines, which are typically capable of meeting a 2.0-ppm limit. Simple-cycle turbines have higher exhaust gas temperatures than combined-cycle turbines because they do not use a heat recovery steam boiler, which removes some of the heat from the

exhaust and reduces the exhaust gas temperature. For this facility, the turbine exhaust temperatures from the simple-cycle turbines will exceed 863 degrees F, according to the permit application. These high exhaust temperatures can damage a standard SCR catalyst. As a result, simple-cycle turbines must use less-efficient high-temperature SCR catalysts, or must introduce a large amount of dilution air to cool the exhaust if they use a standard SCR catalyst. Both of these approaches lead to less efficient SCR performance as compared to a combined-cycle operation. High-temperature catalysts typically have a lower NO_x conversion efficiency as compared to conventional SCR catalysts operating at a lower operating temperature. These catalysts have NO_x conversion efficiency below 90% at elevated temperatures above 800°F,¹⁷ whereas standard catalysts have NO_x conversion efficiencies of greater than 90% at 600 to 700°F.¹⁸ Dilution air fans can be used to cool the exhaust prior to entering the SCR system, but this approach has its own drawbacks. The introduction of dilution air may cool the exhaust into the appropriate temperature window, but there may be exhaust hot spots that lower catalyst NO_x conversion rates. Optimum SCR performance requires uniform temperature profile, flow profile, and NO_x concentration profile across the SCR catalyst face, and introducing large amounts of dilution air disrupts this uniformity. Changing turbine loads also tends to disrupt this uniformity, which makes controlling NO_x more difficult with the simple-cycle peaking turbines proposed for the Mariposa Energy Project. The facility will operate in a load-following mode some of the time and this would mean non-steady-state operation where the exhaust temperature, flowrate, and NO_x concentration all vary as the turbine load is changing. For all of these reasons, the District has concluded that the NO_x emissions performance that can be achieved with combined-cycle turbines would not be achievable for simple-cycle turbines. The District has therefore reviewed only simple-cycle turbines in evaluating what emissions limits have been achieved in practice by other facilities. As shown in Table 18, 2.5 ppm is the most stringent emissions limitation that has been achieved by such facilities.

The District has therefore determined that 2.5 ppm, averaged over 1-hour, is the BACT emission limit for NO_x for the simple-cycle gas turbines. The District is also proposing corresponding hourly, daily and annual mass emissions limits. Compliance with the NO_x permit limits will be demonstrated on a continuous basis using a Continuous Emissions Monitor (CEM).

This proposed BACT emissions limit is consistent with the District's BACT Guidelines for this type of equipment. District BACT Guideline 89.1.3 does not specify BACT 1 (technologically feasible and cost-effective) for NO_x for a simple-cycle gas turbine with a rated output > 40 MW. District BACT Guideline 89.1.3 does specify BACT 2 (achieved in practice) as 2.5 ppmvd @ 15% O₂ averaged over one hour, typically achieved through the use of High Temperature Selective Catalytic Reduction (SCR) with ammonia injection in conjunction with steam or water injection.

¹⁷ BASF, High Temperature SCR for simple-cycle gas turbine applications, 2007

¹⁸ BASF, NO_x Cat™ VNX SCR Catalyst for natural gas turbines and stationary engines, 2009

5.3 Best Available Control Technology for Carbon Monoxide (CO) for Turbines

Carbon monoxide is a colorless odorless gas that is a product of incomplete combustion. The District is proposing a BACT permit limit of 2.0 ppm CO (averaged over three hours). A 2.0-ppm BACT limit for this facility would be lower than what has been achieved in practice with other similar simple-cycle turbines, and would be the lowest emissions limit that would be technologically feasible and cost-effective. This emissions rate will be achieved through the use of good combustion practice and an oxidation catalyst, which are the most stringent available controls.

The District began its BACT analysis by evaluating the most effective control device and/or technique that has been achieved in practice at similar facilities, or is technologically feasible and cost-effective, pursuant to the District's definition of BACT in Regulation 2-2-206. As with NO_x, the District has examined both combustion controls to reduce the amount of carbon monoxide generated and post-combustion controls to remove carbon monoxide from the exhaust stream.

Combustion Controls

Carbon monoxide is formed by incomplete combustion. Incomplete combustion occurs when there is not enough air to fully combust the fuel, and when the air and fuel are not properly mixed due to poor combustor tuning. Maximizing complete combustion by ensuring an adequate air/fuel mixture with good mixing will reduce carbon monoxide emissions by preventing its formation in the first place.

Increasing combustion temperatures can also promote complete combustion, but doing so will increase NO_x emissions due to thermal NO_x formation as described in the previous section. The District prioritizes NO_x control over carbon monoxide control because the Bay Area is not in compliance with the federal standards for ozone, which is formed by NO_x emissions reacting with other pollutants in the atmosphere. The District therefore does not favor increasing combustion temperatures to control carbon monoxide. Instead, the District favors approaches that reduce NO_x to the lowest achievable rate and then optimize carbon monoxide emissions for that level of NO_x emissions.

Good Combustion Practice: The District has identified good combustion practice as an available combustion control technology for minimizing carbon monoxide formation during combustion. Good combustion practice utilize "lean combustion" – large amount of excess air – to produce a cooler flame temperature to minimize NO_x formation, while still ensuring good air/fuel mixing with excess air to achieve complete combustion, thus minimizing CO emissions. This good combustion practice can be used with the water injection technology selected for minimizing NO_x emissions.

Post-Combustion Controls

The District has also identified two post-combustion technologies to remove carbon monoxide from the exhaust stream.

Oxidation Catalysts: An oxidation catalyst oxidizes the carbon monoxide in the exhaust gases to form CO₂. Oxidation catalysts are a proven post-combustion control technology widely in use on large gas turbines to abate CO and POC emissions.

EMx™: EMx™, described above in the NO₂ discussion, is a multimedia control technology that abates CO and POC emissions as well as NO_x. EMx™ technology uses a catalyst to oxidize carbon monoxide emissions to form CO₂, and is therefore also an oxidation catalyst. However, it is not a stand-alone oxidation catalyst since the EMx™ is also a NO_x reduction device. Hence, it is identified as a device separate from the oxidation catalyst. EMx™ has been demonstrated on a 45 MW Alstom GTX 100 combined-cycle gas turbine at the Redding Electric Municipal Plant in Redding, CA, and the manufacturer has indicated that it could feasibly be scaled up to larger size gas turbines as discussed above in the NO_x BACT analysis. The District is not aware of any EMx™ installations on simple-cycle peaker units.

Oxidation catalysts are capable of maintaining carbon monoxide below 2 ppmvd @ 15% O₂ (3-hour average), depending on load and combustor tuning (as emissions from the gas turbines vary greatly depending on these factors). This is the most effective level of control that can be achieved by post combustion controls. There is no CO emissions data for EMx™ installation on a gas turbine of this size and in peaking service. Therefore, the District has determined that the use of good combustion practice and the use of an oxidation catalyst is BACT for simple-cycle gas turbines.

Based on the foregoing analysis, the District has determined that the proposed combination of good combustion practice to reduce the formation of carbon monoxide during combustion and an oxidation catalyst to remove carbon monoxide from the gas turbines exhaust satisfies the BACT requirement.

Determination of BACT Emissions Limit for Carbon Monoxide (CO) for Simple-Cycle Gas Turbines

The District is also proposing a CO BACT limit of 2.0 ppm, which is more stringent than what has been achieved in practice at other similar simple-cycle facilities and is the most stringent limit that is technologically feasible and cost-effective.

To establish what level of emissions performance has been achieved in practice for this type of facility, the District reviewed the CO emission limits of other large simple-cycle power plants using oxidation catalyst systems. As with the NO_x comparison set forth in Table 18 above, the District reviewed BACT determinations for CO at the EPA RACT/BACT/LAER Clearinghouse, ARB BACT Clearinghouse and recent projects undergoing CEC licensing.

TABLE 20. CO EMISSION LIMITS FOR LARGE SIMPLE-CYCLE POWER PLANTS USING OXIDATION CATALYSTS	
Facility	CO (ppmvd @ 15% O ₂)
Panoche Energy Center, SJVAPCD GE LMS100 Gas Turbines, 100 MW each	6 (3-hr)
Walnut Creek Energy Park, SCAQMD GE LMS100 Gas Turbines, 100 MW each	6 (1-hr)
Sun Valley Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	6 (1-hr)
CPV Sentinel Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	6 (1-hr)
Lambie Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	6 (3-hr)
Riverview Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	6 (3-hr)
Wolfskill Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	6 (3-hr)
Goosehaven Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	6 (3-hr)
Los Esteros Critical Energy Facility, BAAQMD GE LM6000 Gas Turbines, 49 MW each	4 (3-hr)

A CO permit limit of 4 ppm was the lowest for a simple-cycle gas turbine abated by an oxidation catalyst. The District therefore determined that 4-ppm (3-hour average) is the most stringent emission limitation that has been achieved in practice for this type of facility.

These BACT emission rates are consistent with the District's BACT Guidelines for this type of equipment. District BACT Guideline 89.1.3 specifies BACT 2 (achieved in practice) for CO for simple-cycle gas turbines with a rated output of ≥ 40 MW as a CO emission concentration of ≤ 6.0 ppmvd @ 15% O₂ and the use of an oxidation catalyst. This BACT specification is based upon several GE LM6000 gas turbine permits in the Bay Area. BACT 1 (technologically feasible/cost-effective) is currently not specified.

The District also considered whether it would be technically feasible and cost-effective to require the proposed facility to meet an emission limit below the 4.0-ppm that has been achieved by other similar facilities. The District has concluded that the facility should be able to achieve a limit of 2.0 ppm (averaged over three hour), which is consistent with what combined-cycle facilities can typically achieve. As previously discussed, the simple-cycle gas turbines utilize water injection and are very similar to many combined cycle gas turbine projects. The primary difference is the lack of a heat recovery steam generator and the higher stack exhaust temperatures. The higher exhaust temperatures may negatively impact the SCR performance, but the higher exhaust temperatures will not adversely impact the oxidation catalyst performance.

District then considered whether it would be technically feasible and cost-effective to require the proposed facility to meet an emission limit of 2.0-ppm for one hour. The District found that although it may be technically feasible to do so, it would not be cost-effective under the District's BACT cost-effectiveness guidelines given the large costs involved. Additionally, a large catalyst capable of meeting a CO permit limits as 2.0 ppm for one hour may have other implementation problems such as a high back pressure which could adversely impact turbine operating performance and efficiency.

Following is the information that was submitted by the applicant to determine whether the reduction of CO from 2 ppm, 3-hr average to 2 ppm, 1-hr average was cost effective. Table 20 has the necessary capital costs and Table 21 has the operating costs.

TABLE 21. CAPITAL COSTS TO REDUCE CO EMISSIONS FROM 2 PPM FOR 3-HOURS TO 2 PPM FOR 1-HOUR		
DIRECT CAPITAL COSTS (2009 \$)		Explanation of Cost Estimates Per Turbine
1. Purchase Equipment		Base Cost
A) Pollution Control Equipment	\$100,000	EIT Proposal C10-109 (2 ppm 3-hr average to 2 ppm for 1-hr average CO emission levels)
B) Instrumentation & Controls (No CEMS)	\$0	EPA1998 10% of Base Cost (assumed \$0 for incremental assessment)
C) Freight & Taxes	\$13,000	8% Taxes; 5% Freight; on 1A & 1B
Total Purchased Equip. Costs (TEC):	\$113,000	Sum 1A, 1B, 1C
2. Installation Costs:		
A) Foundation & Supports	\$0	EPA1998 8% of TEC
B) Erection and Handling	\$0	EPA1998 14% of TEC
C) Electrical	\$0	EPA1998 4% of TEC
D) Piping	\$0	EPA1998 2% of TEC
E) Insulation	\$0	1% of TEC
F) Painting	\$0	EPA1998 1% of TEC
G) Site Preparation	\$0	0% of TEC
Total Installation Costs (TINC):	\$0	Sum 2A, 2B, 2C, 2D, 2E, 2F, 2G
Total Direct Capital Costs (TDCC):	\$113,000	Sum TEC, TINC
INDIRECT CAPITAL COSTS		
1. Engineering & Supervision	\$11,300	EPA1998 10% of TEC
2. Construction and Field Exp.	\$5,650	OAQPS 5% of TEC
3. Contractor Fees	\$11,300	OAQPS 10% of TEC
4. Start-up	\$2,260	OAQPS 2% of TEC
5. Performance Testing	\$1,130	OAQPS 1% of TEC
Total Indirect Capital Costs (TICC):	\$31,640	Sum 1, 2, 3, 4, 5
Total Direct & Indirect Capital Costs (TDICC):	\$144,640	Sum TDCC, TICC
Contingency (@12%):	\$17,357	12% TDICC (std engineering accuracy)
TOTAL CAPITAL COSTS (TCC):	\$161,997	Sum TDICC, Contingency

TABLE 22 ANNUAL OPERATING COSTS TO REDUCE CO EMISSIONS FROM 2 PPM FOR 3-HOURS TO 2 PPM FOR 1-HOUR		
DIRECT OPERATING COSTS (2003 \$)	Cost in \$	Explanation of Cost Estimates per Turbine
1. Operating Labor	\$0	EPA1998 3 hr/day, @ 41.50 hr
2. Supervisory Labor	\$0	OAQPS 15% Operating Labor
3. Maintenance Labor & Materials	\$7,574	0.5 hr/day, \$41.50/hr, + 100% materials (estimated at \$0)
4. Electricity Expense (\$0.0527/kWh)	\$0	
5. Catalyst Cost (replace)	\$0	
6. Fuel Penalty (\$0.0041/scf gas)	\$7,850	0.15% fuel increase/inch wc (0.7 EIT Proposal)
7. Annual Catalyst Cost	\$0	Initial Catalyst will last 15 year period
Total Direct Operating Costs (TDOC):	\$15424	Sum 1 through 7
INDIRECT OPERATING COSTS		
1. Overhead	\$4,544	OAQPS 60% Total Labor
Total Indirect Operating Costs (TIOC):	\$4,544	Sum 1
CAPITAL CHARGES COSTS		
1. Property Tax	\$1,620	OAQPS 1% TCC
2. Insurance	\$1,620	OAQPS 1% TCC
3. General Administrative	\$3,240	OAQPS 2% TCC
4. Capital Recovery Cost (7%, 15 years)	\$17,787	10.98%, TCC
Total Capital Charges Costs (TCCC):	\$24,267	Sum 1, 2, 3, 4
TOTAL ANNUALIZED OPERATING COSTS:	\$44,235	Sum TDOC, TIOC, TCCC
Per Turbine		
Base Uncontrolled Case	2.0	ppm - 3 hour - assumed CO concentration of 2 ppm
Annual Emission Rate	4.2	tpy (100.8 TPY @ 48 ppm * 2/48) Startup/Shutdown Excluded
Controlled Case Emissions		
CO Concentration	1.5	ppm (1-hr) assumed CO concentration of 1.5 ppm
Annual Emission Rate:	3.1	tpy (4.2 TPY @ 2 ppm * 1.5/2) Startup/Shutdown Excluded
CO Reduction from Uncontrolled Case:	1.0	tpy
Control Cost Effectiveness:	\$42,500	per ton CO per turbine

The Air District evaluated information from the applicant on the costs and emissions reduction benefits of installing a larger oxidation catalyst capable of consistently maintaining emissions at 2 ppm for 1-hour. Based on these analyses, the cost of achieving a 2-ppm for 1-hour permit limit

would be an additional \$42,500 per year per ton of CO for each turbine (above what it would cost to achieve a 2.0 ppm 1-hour limit).

Based on these high costs (on a per-ton basis) and the relatively little additional CO emissions benefit to be achieved (on a per-dollar basis), requiring a 2 ppm for 1-hour CO permit limit cannot reasonably be justified. The Air District has not adopted its own cost-effectiveness. A review of other districts in California found none that consider additional CO controls appropriate as BACT where the total (average) cost-effectiveness will be greater than \$400 per ton.

The District has therefore determined that BACT for CO for this facility is the use of good combustion practice with abatement by an oxidation catalyst, and a permit limit of 2 ppmvd @ 15% O₂ averaged over 3 hours. This proposed BACT limit for CO is based on a review of the feasible BACT CO control technologies, a review of comparable permit limits for simple-cycle gas turbines, and the fact that CO emissions from a simple-cycle gas turbine equipped with water injection should be equivalent to a similar combined-cycle gas turbine. The proposed 2 ppmvd @ 15% O₂ averaged over 3-hours permit limit for CO is the lowest that the District is aware of for a simple-cycle gas turbine. CO exhaust gas concentrations will be continuously monitored by a continuous emissions monitor while the turbines are in operation.

Good combustion practice is maximizing complete combustion by ensuring an adequate air-to-fuel mixture with good mixing. This mixing would be difficult to monitor, but low CO levels, measured by the CO CEM, are an indication of good combustion practice.

5.4 Best Available Control Technology for Precursor Organic Compounds (POC) for Turbines

The Precursor Organic Compound (POC) emissions from the simple-cycle gas turbines are subject to District BACT requirements since the potential to emit exceeds 10 pounds of POC per highest day. The emissions of POC from combustion sources are products of incomplete combustion like CO emissions. Emissions control techniques for CO are also applicable to POC emissions from combustions sources. The appropriate BACT control device or technique for CO is therefore also the BACT control device or technique for POC.

The District has reviewed the available control technologies in the BACT analysis for CO (equally applicable to POC) and determined that good combustion practice and abatement using an oxidation catalyst are the BACT technologies for controlling POC from the proposed simple-cycle combustion turbines at Mariposa Energy Project.

There currently is no BACT 1 (technologically feasible/cost-effective) specification for POC for the simple-cycle turbines in the District BACT guidelines. Currently, District BACT Guideline 89.1.3 specifies BACT 2 (achieved in practice) for POC for simple-cycle gas turbines with an output rating ≥ 40 MW as 2.0 ppmv, dry @ 15% O₂, which is typically achieved through the use of an oxidation catalyst. This is based upon several LM6000 gas turbine permits which were originally permitted with a POC emission limits in pound per hour or pounds per million Btu equivalents to 2.0 ppmvd @ 15% O₂.

The District then evaluated what the appropriate BACT emission limit should be for POC. The District reviewed permit limits from similar facilities, as summarized in Table 22.

TABLE 23. POC EMISSION LIMITS FOR LARGE SIMPLE-CYCLE GAS TURBINES	
Facility	POC (ppmvd @ 15% O₂)
Panoche Energy Center, SJVAPCD GE LMS100 Gas Turbines, 100 MW each	2 (3-hr)
Walnut Creek Energy Park, SCAQMD GE LMS100 Gas Turbines, 100 MW each	2 (1-hr)
Sun Valley Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	2 (1-hr)
CPV Sentinel Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	2 (1-hr)
Lambie Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2 (1-hr)
Riverview Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2 (1-hr)
Wolfskill Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2 (1-hr)
Goosehaven Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2 (1-hr)
Los Esteros Critical Energy Facility, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2 (1-hr)

The District has reviewed the POC permit emissions limits for similar facilities shown in Table 23 and determined that 2.0 ppm is the lowest emissions limit that has been achieved in practice for a simple-cycle gas turbine abated by an oxidation catalyst.

Then District considered whether it would be technically feasible and cost-effective to require the proposed facility to meet an emission limit below the proposed 2.0 ppm POC limit. The Air District evaluated information from the applicant, below, on the costs and emissions reduction benefits of installing a larger oxidation catalyst capable of consistently maintaining emissions at 1 ppm for 1 hour. Based on these analyses, the cost of achieving 1 ppm would be an additional \$8,822 per year per ton of POC for each turbine.

Based on these costs (on a per-ton basis) and the additional POC emissions benefit to be achieved (on a per-dollar basis), requiring a 1-ppm @ 1 hour POC permit limit is reasonable. (See the applicant quote below in Table 23 and Table 24 supplied on May 26, 2010). The guidelines for POC and a review of other districts in California found that additional POC controls are appropriate as BACT where the total (average) cost-effectiveness will be less than \$17,500 per ton.

TABLE 24 CAPITAL COSTS TO REDUCE POC EMISSIONS FROM 2 PPM TO 1 PPM FOR 1-HOUR		
DIRECT CAPITAL COSTS (2009 \$)		Explanation of Cost Estimates Per Turbine
1. Purchase Equipment		Base Cost
A) Pollution Control Equipment	\$50,000	EIT Email dated May 18, 2010.
B) Instrumentation & Controls (No CEMS)	\$0	EPA1998 10% of Base Cost (assumed \$0 for incremental assessment)
C) Freight & Taxes	\$0	8% Taxes; 5% Freight; on 1A & 1B
Total Purchased Equip. Costs (TEC):	\$50,000	Sum 1A, 1B, 1C
2. Installation Costs:		
A) Foundation & Supports	\$0	EPA1998 8% of TEC
B) Erection and Handling	\$0	EPA1998 14% of TEC
C) Electrical	\$0	EPA1998 4% of TEC
D) Piping	\$0	EPA1998 2% of TEC
E) Insulation	\$0	1% of TEC
F) Painting	\$0	EPA1998 1% of TEC
G) Site Preparation	\$0	0% of TEC
Total Installation Costs (TINC):	\$0	Sum 2A, 2B, 2C, 2D, 2E, 2F, 2G
Total Direct Capital Costs (TDCC):	\$50,000	Sum TEC, TINC
INDIRECT CAPITAL COSTS		
1. Engineering & Supervision	\$5,000	EPA1998 10% of TEC
2. Construction and Field Exp.	\$2,500	OAQPS 5% of TEC
3. Contractor Fees	\$5,000	OAQPS 10% of TEC
4. Start-up	\$1,000	OAQPS 2% of TEC
5. Performance Testing	\$500	OAQPS 1% of TEC
Total Indirect Capital Costs (TICC):	\$14,000	Sum 1, 2, 3, 4, 5
Total Direct & Indirect Capital Costs (TDICC):	\$64,000	Sum TDCC, TICC
Contingency (@12%):	\$7,680	12% TDICC (std engineering accuracy)
TOTAL CAPITAL COSTS (TCC):	\$71,680	Sum TDICC, Contingency
DIRECT OPERATING COSTS (2003 \$)	Cost in \$	Explanation of Cost Estimates per Turbine
1. Operating Labor	\$0	EPA1998 1 hr/day, @ 80.50 hr
2. Supervisory Labor	\$0	OAQPS 15% Operating Labor
3. Maintenance Labor & Materials	\$11470	140 hr/year, \$80.50/hr, + \$200 materials (estimated at \$0)
4. Electricity Expense (\$0.0527/kWh)	\$0	
5. Catalyst Cost (replace)	\$0	NA

TABLE 24 CAPITAL COSTS TO REDUCE POC EMISSIONS FROM 2 PPM TO 1 PPM FOR 1-HOUR		
6. Fuel Penalty (\$0.0041/scf gas)	\$2,243	0.15% fuel increase/inch wc (0.7 EIT Proposal)
7. Annual Catalyst Cost	\$0	Initial Catalyst will last 15 year period
Total Direct Operating Costs (TDOC):	\$13713	Sum 1 through 7
INDIRECT OPERATING COSTS		
1. Overhead	\$6762	OAQPS 60% Total Labor
Total Indirect Operating Costs (TIOC):	\$6762	Sum 1
CAPITAL CHARGES COSTS		
1. Property Tax	\$717	OAQPS 1% TCC
2. Insurance	\$717	OAQPS 1% TCC
3. General Administrative	\$1,434	OAQPS 2% TCC
4. Capital Recovery Cost (7%, 15 years)	\$7,870	10.98%, TCC
Total Capital Charges Costs (TCCC):	\$10,738	Sum 1, 2, 3, 4
TOTAL ANNUALIZED OPERATING COSTS:	\$20555	Sum TDOC, TIOC, TCCC
Base Uncontrolled Case	3.0	Per Turbine ppm (GE Guarantee)
Annual Emission Rate	3.5	TPY (3.74 Lb POC/hr * 3.0 ppm POC/6.4 ppm POC * 4000 hr/yr * 2000 lb/ton)
Controlled Case Emissions		
POC Concentration	1.0	ppm (3 hour)
Annual Emission Rate:	1.2	TPY (3.5 TPY * 1 ppm POC /3 ppm POC)
POC Reduction from Uncontrolled Case:	2.34	tpy
Control Cost Effectiveness:	\$13,339	per ton of POC per turbine
References: OAQPS - OAQPS Cost Control Manual, 5th ED., February 1996. EPA1998 - Cost Effectiveness for Oxidation Catalyst Control of HAP Emissions from Stationary Combustion Turbines, * EPA memo dated 12-30-99, Emissions Standards Division, Docket A-95-51, and May 14, 1999 memo on Stationary CT control cost options.		

The District has therefore determined that BACT for the simple-cycle gas turbines for POC is the use of good combustion practice and abatement with an oxidation catalyst to achieve a permit limit for each gas turbine of 0.616 lb per hour or 0.00127 lb/MMBtu, which is equivalent to 1 ppm POC, 1-hr average.

5.5 Best Available Control Technology for Particulate Matter (PM) for Turbines

For emissions of particulate matter (PM), the District is proposing to require the use of PUC-quality low-sulfur natural gas, and good combustion practices as BACT control technologies. The District is also proposing a BACT PM emissions limit of 2.5 lb/hr, which corresponds to an emission rate of 0.0052 pounds per MMBtu of natural gas burned (lb/MMBtu). This emissions limit is based on a review of permit limits and emissions data from other similar simple-cycle natural gas fired combustion turbines. The District's proposed BACT determination is explained below.¹⁹

Control Technology Review:

As with the other pollutants addressed above, control technologies for PM can be grouped into two categories: (1) combustion controls, and (2) post-combustion controls.

Combustion Controls

- **Good Combustion Practice:** The District has identified good combustion practices as an available combustion control technology for minimizing unburned hydrocarbon formation during combustion. Good combustion will ensure proper air/fuel mixing to achieve complete combustion, thus minimizing emissions of unburned hydrocarbons that can lead to formation of PM at the stack.
- **Clean-burning fuels:** The use of clean-burning fuels, such as natural gas that has only trace amounts of sulfur that can form particulates, will result in minimal formation of PM during combustion. The use of natural gas is commercially available and demonstrated for the Mariposa Energy Project gas turbines.

Post-Combustion Controls

- **Electrostatic precipitators:** Electrostatic precipitators are used on solid fuel boilers and incinerators to remove PM from the exhaust. Electrostatic precipitators use a high-voltage direct-current corona to electrically charge particles in the gas stream. The suspended particles are attracted to collecting electrodes and deposited on collection plates. Particles are collected and disposed of by mechanically rapping the electrodes and plates and dislodging the particles into collection hoppers.

¹⁹ This facility is subject to BACT requirements for PM₁₀ only. PM_{2.5}, a subset of PM₁₀, is regulated under federal requirements in 40 C.F.R. Section 52.21 (PSD) and 40 C.F.R. Part 51, Appendix S (Non-Attainment NSR). The facility is not subject to PSD or PM_{2.5} Non-Attainment NSR permit requirements under Section 52.21 or Appendix S because the facility is not a "major facility" for the purposes of these regulations. The District is therefore not conducting a PSD permitting analysis or an Appendix S permitting analysis for PM_{2.5}. The District notes, however, that for combustion turbines essentially all of the PM emissions are less than one micron in diameter, so it is both PM₁₀ and PM_{2.5}. (See AP-42, Table 1.4-2, footnote c, 7/98 (available at <http://www.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf>). Moreover, the same emissions control technologies that will be effective for PM₁₀ for this facility will also be similarly effective for PM_{2.5}. The District's BACT analysis and emissions limit for PM₁₀ will also therefore effectively be a BACT limit on PM_{2.5} emissions as well, even though the facility is not subject to the federal PM_{2.5} BACT requirements.

- **Baghouses:** Baghouses are used to collect PM by drawing the exhaust gases through a fabric filter. Particulates collect on the outside of filter bags that are periodically shaken to release the particulates into hoppers.

Good combustion practice and clean-burning fuels are common control devices/techniques that are technically feasible for simple-cycle natural gas fired combustion turbines and are often used to control emissions from sources of this type. The District has therefore determined that these technologies are achieved-in-practice and are technically feasible and cost-effective for the Mariposa Energy Project.

With respect to the add-on controls – electrostatic precipitators and baghouses – these control devices are not achieved-in-practice for natural gas fired combustion turbines and are not technically feasible here. These devices are normally used on solid-fuel fired sources or others with high PM emissions, and are not used in natural gas fired applications, which have inherently low PM emissions. The District is not aware of any natural gas fired combustion turbine that has ever been required to use add-on controls such as these. The District also reviewed the EPA BACT/LAER Clearinghouse and confirmed that EPA has no record of any post-combustion particulate controls that have been required for natural gas fired gas turbines. The District has therefore determined that these control devices are not achieved-in-practice for purposes of the BACT analysis.

The District has also determined that these devices would not be technologically feasible here. If add-on control equipment were installed it would create significant backpressure that would significantly reduce the efficiency of the plant and would cause more emissions per unit power produced. Moreover, these devices are designed to be applied to emissions streams with far higher particulate emissions, and they would have very little effect on the low-PM emissions streams from this facility in further reducing PM emissions.²⁰ It takes an emissions stream with a much higher grain loading for these types of abatement devices to operate efficiently. This low level of abatement efficiency (if any) also means that these types of control devices would not be cost-effective, even if they could feasibly be applied to this type of source. For all of these reasons, post-combustion particulate control equipment is not technologically feasible for the proposed Mariposa Energy Project.

The District has therefore determined that low-sulfur natural gas and Good Combustion Practice are the BACT control technologies for the proposed Mariposa Energy Project. For low-sulfur fuel, the highest quality commercially available natural gas is the natural gas that meets the California Public Utilities Commission (PUC) regulatory standard of less than 1.0 grains of sulfur per 100 scf. This PUC standard is the maximum sulfur content at any point in time.²¹ The

²⁰ For example, if a baghouse were installed on the turbines, the turbine exhaust at the *inlet* to the baghouse would contain less PM than is normally seen in baghouse *output*, after abatement. PM emissions from a baghouse are normally in the range 0.0013 to 0.01 grains per standard cubic foot (see *BAAQMD BACT/TBACT Workbook*, Section 11: Miscellaneous Sources), whereas PM emissions from the proposed Mariposa Energy Project turbines would be 0.00118 gr/dscf (@ 15% O₂).

²¹ The 1.0-grain per 100 scf PUC standard is the maximum sulfur content of the gas at any point in time. The actual average content is expected to be less than 0.25 grains per 100 scf. The District has based its calculations of annual

District is therefore proposing a BACT limit for fuel sulfur content of 1.0 grains of sulfur per 100 scf for maximum daily emissions.

This proposed BACT determination is consistent with guidance from the California Air Resources Board in setting BACT for natural gas fired gas turbines. This proposed BACT determination is also consistent with District BACT Guideline 89.1.3, which specifies BACT for PM₁₀ for simple-cycle gas turbines with rated output of ≥ 40 MW as the exclusive use of clean-burning natural gas with a maximum sulfur content of ≤ 1.0 grains per 100 scf.

Determination of Applicable PM BACT Emissions Limitation:

The District's BACT regulations require the District to implement BACT either as a control device or technique (Regulation 2-2-206.1 and 2-2-206.3) or as an emission limitation (Regulation 2-2-206.3 and 2-2-206.4). Here, in addition to the determination of what control devices/techniques are BACT for this proposed facility, the District is also proposing to implement a numerical PM BACT emission limitation based on the most stringent emission limitation achieved for a natural gas fired simple-cycle combustion turbine facility such as this one pursuant to District Regulation 2-2-206.2. The District is proposing a PM emissions limit of 2.5 lb/hr, which corresponds to 0.0052 lb/MMBtu of natural gas burned. This limit also corresponds to emissions of 60 pounds per day (per turbine), and 0.00298 grains per dry standard cubic foot (15% O₂). This proposed emissions limit would be as stringent as any other PM emission limitation achieved in practice by any other similar natural gas fired simple-cycle combustion turbine source.

To evaluate whether this proposed limit satisfies the BACT requirement, the District compared it with emission limits and performance data from other natural gas fired simple-cycle combustion turbines. Table 25 below presents PM permit limits for projects similar to the simple-cycle gas turbines proposed for the Mariposa Energy Project in descending order by emission rate in lb/MMBtu.

TABLE 25. RECENT BACT PM ₁₀ PERMIT LIMITS FOR LARGE SIMPLE-CYCLE GAS TURBINES			
Facility	PM ₁₀ (lb/hr)	Size (MMBtu/hr)	PM ₁₀ (lb/MMBtu)
CPV Sentinel Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	6.0	875.7	0.0069
Panoche Energy Center, SJVAPCD GE LMS100 Gas Turbines, 100 MW each	6.0	909.7	0.0066
Walnut Creek Energy Park, SCAQMD GE LMS100 Gas Turbines, 100 MW each	6.0	904	0.0066
Sun Valley Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	6.0	904	0.0066
Lambie Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	3.0	500	0.0060

emissions on this 0.25-grain per 100 scf average sulfur content. Note that a portion of the sulfur contained in natural gas is intentionally added as an odorant to allow for the detection of leaks, which would be a safety concern.

TABLE 25. RECENT BACT PM ₁₀ PERMIT LIMITS FOR LARGE SIMPLE-CYCLE GAS TURBINES			
Facility	PM ₁₀ (lb/hr)	Size (MMBtu/hr)	PM ₁₀ (lb/MMBtu)
Riverview Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	3.0	500	0.0060
Wolfskill Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	3.0	500	0.0060
Goosehaven Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	3.0	500	0.0060
Gilroy Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2.5	467.6	0.0053
Los Esteros Critical Energy Facility, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2.5	472.6	0.0053

Notes: 1. Please note the lb/MMBtu values are not the permit limits and simply allow comparison of limits for different sized units.

Based on this review of permit limits for similar simple-cycle natural gas fired turbines, the District has determined that no facility has achieved a permit limit that is more stringent than the 2.5 lb/hr limit the District is proposing here, which corresponds to 0.0052 lb/MMBtu.

The District also reviewed PM source test data for a number of comparable facilities. The data set below is for GE LM6000 simple-cycle gas turbines abated by an oxidation catalyst and SCR and is shown in the Table 26 below.

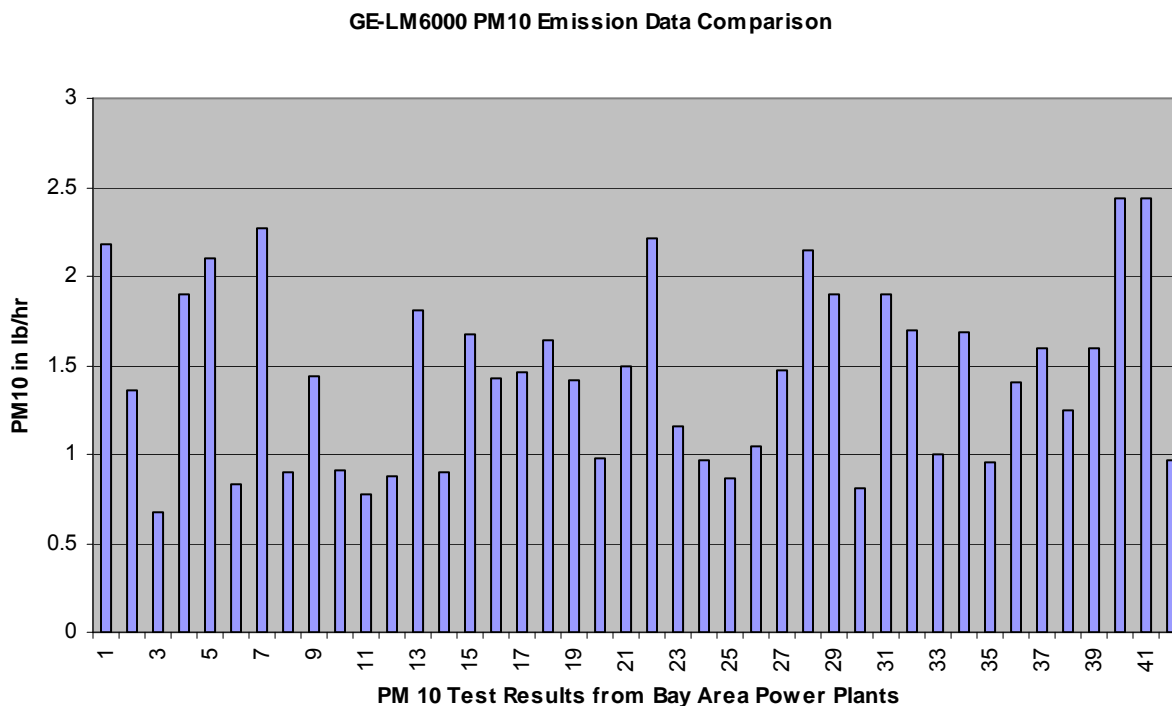
TABLE 26. SUMMARY OF GENERAL ELECTRIC LM-6000 SIMPLE-CYCLE GAS TURBINE PARTICULATE EMISSIONS DATA

Facility	Test Date	Source	PM lb/hour	PM FH lb/hour	PM BH lb/hour	Front %	Back %	Reported PM lb/MMBtu
Creed Energy Center	1/31/2003	S-1	2.18	1.05	1.13	48.2	51.8	0.0047
Creed Energy Center	7/6/2006	S-1	1.363	0.553	0.81	40.6	59.4	0.0028
Creed Energy Center	5/7/2009	S-1	0.6746	0.1948	0.4798	28.9	71.1	0.0012
Lambie Energy Center	1/16/2003	S-1	1.9	0.56	1.34	29.5	70.5	0.0042
Lambie Energy Center	5/5/2006	S-1	2.104	1.429	0.674	67.9	32.0	0.0039
Lambie Energy Center	5/11/2009	S-1	0.83	0.3488	0.4807	42.0	57.9	0.0016
Los Esteros Energy	7/26-7/27/05	S-1	2.266	1.016	1.25	44.8	55.2	0.0042
Los Esteros Energy	7/26-7/27/05	S-2	0.896	0.363	0.533	40.5	59.5	0.0016
Los Esteros Energy	7/28/2005	S-3	1.44	0.578	0.862	40.1	59.9	0.0025
Los Esteros Energy	7/27-7/29/05	S-4	0.915	0.326	0.589	35.6	64.4	0.0016
Los Esteros Energy	9/8/2006	S-1	0.775	0.307	0.468	39.6	60.4	0.0015
Los Esteros Energy	9/8/2006	S-2	0.871	0.331	0.54	38.0	62.0	0.0015
Los Esteros Energy	9/6-9/7/06	S-3	1.805	0.398	1.407	22.0	78.0	0.0033
Los Esteros Energy	9/6-9/7/06	S-4	0.904	0.318	0.586	35.2	64.8	0.0017
Los Esteros Energy	7/25-7/26/07	S-1	1.672	0.967	0.705	57.8	42.2	0.0030
Los Esteros Energy	7/25-7/26/07	S-2	1.429	0.541	0.888	37.9	62.1	0.0025
Los Esteros Energy	7/24-7/25/07	S-3	1.456	0.666	0.79	45.7	54.3	0.0025
Los Esteros Energy	7/24-7/25/07	S-4	1.646	0.973	0.673	59.1	40.9	0.0027
Los Esteros Energy	5/29-5/30/07	S-1	1.4145	0.6957	0.7189	49.2	50.8	0.0026
Los Esteros Energy	5/28-5/29/07	S-2	0.9769	0.3191	0.6578	32.7	67.3	0.0018
Los Esteros Energy	5/28-5/29/07	S-3	1.49	0.4393	1.0555	29.5	70.8	0.0027
Los Esteros Energy	5/29-5/30/07	S-4	2.21	1.345	0.8629	60.9	39.0	0.0041
Los Esteros Energy	5/13/2009	S-1	1.16	0.4811	0.68	41.5	58.6	0.0020
Los Esteros Energy	5/14-5/15/09	S-2	0.969	0.4702	0.4983	48.5	51.4	0.0018
Los Esteros Energy	5/14-5/15/09	S-3	0.864	0.4082	0.4561	47.2	52.8	0.0016
Los Esteros Energy	5/13-5/14/09	S-4	1.04	0.3226	0.7186	31.0	69.1	0.0019
Riverview	5/8/2009	S-1	1.469	0.789	0.68	53.7	46.3	0.0030
Wolfskill	6/2/2004	S-1	2.15	1.3	0.85	60.5	39.5	0.0047
Wolfskill	7/5/2006	S-1	1.9	0.582	1.319	30.6	69.4	0.0034
Wolfskill	5/4/2009	S-1	0.81	0.29	0.52	35.8	64.2	0.0010
Gilroy Energy Center	7/19/2005	S-3	1.9					0.0029
Gilroy Energy Center	7/21/2005	S-4	1.7					0.0022
Gilroy Energy Center	7/21/2005	S-5	1					0.0016
Gilroy Energy Center	5/23/2006	S-3	1.69					0.0020
Gilroy Energy Center	5/24/2006	S-4	0.95					0.0010
Gilroy Energy Center	5/22/2006	S-5	1.41					0.0020
Gilroy Energy Center	5/23/2007	S-3	1.6	0.6132	0.9856	38.3	61.6	0.0030
Gilroy Energy Center	5/24/2007	S-4	1.25	0.5443	0.7016	43.5	56.1	0.0019
Gilroy Energy Center	5/25/2007	S-5	1.6	0.6769	0.9193	42.3	57.5	0.0027
Goosehaven	1/23/2003	S-1	2.44					0.0047
Goosehaven	7/6/2006	S-1	2.438	1.327	1.112	54.4	45.6	0.0040
Goosehaven	5/6/2009	S-1	0.9716	0.1481	0.8235	15.2	84.8	0.0017
							Average	0.0026
							Maximum	0.0047

Notes: All of these facilities use an oxidation catalyst to reduce CO emissions and an SCR system to reduce NO_x emissions, as the proposed Mariposa Energy Project will.

Following is a graphical representation of the data in Table 26:

General Electric LM-6000 simple-cycle gas turbine particulate emissions data comparison



It can be seen that there is significant variation in the data. The main sources of variation are as follows a) ambient air quality conditions, b) fuel quality, c) water quality, and d) measurement uncertainty. Since the combustion process by itself creates a very small amount of PM10 emissions, the contribution of the gas turbine to the variation in PM10 is negligible. Based on the above data, it is apparent that 7 out of 42 exceed 2.0 lb/hr.

The data from these facilities shows that PM emissions from sources of this type can be highly variable. Although in many cases turbines of this type will emit less than 0.0052 lb/MMBtu PM, the data shows that it would not be possible to impose a limit below 2.5 lb/hr for the Mariposa Energy Project (corresponding to 0.0052 lb/MMBtu). The facility would not be able to consistently meet a permit limit below 2.5 lb/hr for PM as an enforceable not-to-exceed permit limit. The District therefore concludes that better emissions performance has not been achieved in practice or shown to be technically feasible for this type of equipment.

The District has concluded that simple-cycle turbines of the type that will be used at the proposed Mariposa Energy Project cannot achieve PM emissions as low as combined-cycle turbines (2 lb/hr). Simple-cycle turbines have a higher exhaust temperature than combined-cycle turbines, which use a heat recovery boiler to recover some of the waste heat in the turbine exhaust in order to, generate additional power.

The higher exhaust temperatures seen by the oxidation catalyst and SCR system in simple-cycle facilities cause more PM to be formed in the abatement equipment compared with lower-temperature combined-cycle facilities. The increased catalyst temperatures may cause the conversion of SO₂ to SO₃ in the exhaust stream. This additional SO₃ will then convert to H₂SO₄ or ammonium sulfate salts, which add to the mass of particulate matter contained in the facility's exhaust stream. For these reasons, PM emissions from simple-cycle turbines equipped with oxidation catalysts and SCR systems for NO_x and CO control will inherently have higher PM emissions than combined-cycle turbines.

In summary, the District has determined that the use of low sulfur natural gas and with Good Combustion Practice is BACT for PM. The District is also proposing a PM BACT emissions limit of 2.5 lb/hour, based on a review of permit limits and source test data from other simple-cycle gas turbines.

5.6 Best Available Control Technology for Sulfur Dioxide (SO₂) for Turbines

The potential emissions of SO₂ from the simple-cycle gas turbines exceed 10 lb per highest day for each turbine. These sources are therefore subject to District BACT requirements for SO₂.

There are two primary mechanisms used to reduce SO₂ emissions from combustion sources: (i) reduce the amount of sulfur in the fuel, and (ii) remove the sulfur from the combustion exhaust gases.

Limiting the amount of sulfur in the fuel is a common practice for natural gas fired power plants. Such plants in California are typically required to combust only California PUC grade natural gas with a sulfur content of less than 1 grain per 100 standard cubic feet (scf). This control technique has been achieved in practice at other facilities, and it is technologically feasible and cost-effective. The District is therefore proposing to require the use of PUC-grade natural gas with a sulfur content of less than 1 grain/100 scf as a BACT control technique for SO₂.

Add-on controls that remove sulfur from the combustion exhaust, such as flue gas desulfurization, are not feasible for natural gas fired power plants and have not been used at such facilities. These types of control devices are typically installed on coal fired power plants that burn fuels with much higher sulfur contents. There are two main types of SO₂ post-combustion control technologies: wet scrubbing and dry scrubbing. Wet scrubbers use an alkaline solution to remove the SO₂ from the exhaust gases and may remove up to 90% of the SO₂ from the exhaust stream. Dry scrubbers use an SO₂ sorbent injected as a powder or slurry to remove the SO₂ and the SO₂ and sorbent are removed by a particulate control device. The abatement efficiencies vary with different types of dry scrubbing technologies, but are generally lower than efficiencies for wet scrubbing technologies. These technologies are not feasible for combustion sources burning low sulfur content natural gas. The SO_x concentrations in the natural gas combustion exhaust gases are too low (less than 1 ppm) for the scrubbing technologies to work effectively or be technologically feasible and cost effective. These control technologies require much higher sulfur concentrations in the combustion exhaust gases to become feasible as a control technology. For this reason, they have not been used at natural gas fired power plants such as the proposed Mariposa Energy Project. As these control technologies have not been

achieved in practice at other similar facilities and are not technologically feasible here, the District is not proposing to require them as BACT for this facility.

Fuel sulfur limits are therefore the only feasible SO₂ control technology for natural gas combustion sources, and the District is proposing to require this technology as BACT. The District is proposing BACT permit limits based on the PUC natural gas specification of a maximum of 1 grain of sulfur per 100 scf of natural gas. The permit limits are based on maximum sulfur content of the fuel and are expressed in units of pounds per hour, pounds per unit of natural gas burned (MMBtu), and pounds per day of SO₂. The emission calculations are shown in Appendix A.

This proposed BACT determination is consistent with the District's BACT Guidelines for SO₂. District BACT Guideline 89.1.3 specifies BACT 2 ("achieved in practice") for SO₂ for simple-cycle gas turbines with an output rating of ≥ 40 MW as the exclusive use of clean-burning natural gas with a sulfur content of ≤ 1.0 grains per 100 scf.

5.7 Best Available Control Technology For Startup and Shutdown Conditions for Turbines

Startup and shutdown periods are a normal part of the operation of natural gas-fired power plants. They involve emission rates that are greater than emissions during steady-state operation and that are highly variable. Emissions are greater during startup and shutdown for several reasons. One reason is that during startup and shutdown, the turbines are not operating at full load where they are most efficient. Another reason is that the exhaust temperatures are lower than during steady-state operations. Post-combustion emissions control systems such as the SCR catalyst and oxidation catalyst do not function optimally at lower temperatures, and so there may be partial or no abatement for NO_x, carbon monoxide and precursor organic compounds for a portion of the startup period.²² Thus, emissions can be minimized by reducing the duration of the startup sequence and by reducing emissions during the startup.

Simple-cycle turbines have inherently low startup emissions because they can quickly come up to full load. This is one reason that they are used to provide peaking load duty with the capability to rapidly accelerate to synchronous speed, synchronize with the grid, ramp up to 100 percent load, and then down to zero load. Simple-cycle turbines are different in this respect than combined-cycle turbines, which incorporate a heat-recovery steam boiler that recovers some of the waste heat in the turbine exhaust to create steam to generate additional power. The combined-cycle system requires additional steam-generating components, and it takes additional time for this equipment to come up to full operating temperature. Nevertheless, simple-cycle turbines still have startup and shutdown periods in which they are not capable of complying with their steady-state emissions limits.

²² Note that emission rates of particulate matter and sulfur oxides are not affected by startups and shutdowns and will be the same as for full load operation as during startup and shutdown periods (2.5 lb/hour for particulate matter, 1.35 lb/hour for SO_x maximum, 0.34 lb/hour SO_x annual average).

Finally, the Mariposa Energy Project turbines are designed for quick starts and also rapidly changing loads to meet electrical system needs. The simple-cycle gas turbines will have the ability to change loads at rates exceeding 12 MW per minute. It is difficult for the NO_x control system to respond to these rapid changes in load.

Because emissions are greater during startup and shutdown periods than during steady-state operation, the BACT limits established in the previous sections for steady-state operations are not technically feasible during these periods. The District is therefore establishing separate BACT limits representing the most stringent emissions limits that have been achieved-in-practice or technologically feasible/cost-effective for this type of facility. To do so, the District has conducted an additional BACT analysis specifically for startup and shutdown periods.

Control Devices and Techniques to Limit Startup and Shutdown Emissions:

The only available approach to reducing startup and shutdown emissions from simple-cycle turbines is to use best work practices. By following the plant equipment manufacturers' recommendations, power plant operators can limit the duration of each startup and shutdown to the minimum duration achievable. Plant operators also use their own operational experience with their particular turbines and ancillary equipment to optimize startup and shutdown emissions. There is no other available control technology or technique beyond implementing best work practices that can further reduce startup and shutdown emissions from simple-cycle turbines.²³

Determination of BACT Emissions Limit for Startup and Shutdown Conditions:

The District is proposing time limits and numerical emissions limits for startups and shutdowns, periods to implement the BACT requirement here. The proposed limits for each operating scenario are outlined below.

Startups

Using best work practices, the facility should be able to complete a typical startup in 10 minutes, based on information provided by the gas turbine manufacturer. Emissions during a typical startup are expected to be 3.5 pounds of NO_x, 3.0 pounds of CO, and 0.058 pounds of POC. Typical startup emissions are summarized in Table 27.

²³ The lack of additional control technologies for simple-cycle turbines is different than with combined-cycle turbines. For combined-cycle turbines, there have been several technological advances that have recently been developed, or are currently under development, that will allow those types of turbines to start up more quickly and with fewer emissions. These include startup procedures that heat up the additional steam-generating equipment used in combined-cycle turbines more quickly, allowing them to reach their optimal operating temperature more quickly; and advances that reduce emissions at lower loads where combined-cycle turbines must operate for extended periods while waiting for the equipment to heat up. These types of advances are not applicable to simple-cycle turbines. Simple-cycle turbines do not have any additional steam generating equipment that needs to be warmed up; and they ramp up very quickly to full load at rates as high as 25 MW per minute and do not spend any significant time operating at lower loads during startups.

TABLE 27. TYPICAL STARTUP EMISSION ESTIMATES FOR FIRST 10 MINUTES	
	Typical Startup - Estimated Emissions (Pounds Per Period Per Turbine per Startup)
Pollutant	(lb/event)
NO _x as (NO ₂)	3.5
CO	3.0
POC	0.058

Note: Please check appendix A for details

Although in a typical startup the turbine will begin producing power within 10 minutes, it will typically take longer for the abatement devices to become fully operational. This is because the control devices do not control NO_x and CO until the catalysts reach the proper operating temperature. In the case of the SCR catalyst, ammonia is not injected until the catalyst reaches a minimum temperature of 600°F. Nonetheless, typical startup emissions are minimal due to the short duration of the typical start time and due to the quick turbine ramp rate that minimizes low-load operation during startup. But these emission estimates are not guaranteed emission rates for every startup. Moreover, startup emissions are highly variable, and it is expected that some startups will take longer than 10 minutes. A number of factors influence startup duration and can lead to longer startup times, including: allowance for the CEM system lag of several minutes to relay compliant NO_x and CO CEM readings, allowance for the ammonia injection rate to stabilize with NO_x concentration, allowance for the oxidation and SCR catalysts time to reach normal operating temperature, and allowance for the adjustment of dilution air required to maintain optimum catalyst temperatures. The District estimates over the life of the facility that a given startup may take as long as 30 minutes to allow the gas turbine and post combustion controls to reach steady-state operation. The District is therefore proposing to establish the not-to-exceed BACT limit for startups at 30 minutes to provide an adequate compliance margin that allows the operators to make appropriate adjustments to system controls in response to system operational conditions. This is the shortest time limit that the turbines can reasonably be expected to meet under all operating conditions over the life of the equipment. Individual startups may be shorter than this proposed 30-minute limit, but an enforceable BACT permit limit must provide 30 minutes to allow an adequate margin of compliance to ensure that the equipment can consistently meet the limit.

In addition, the District has conservatively estimated the emissions that would result from a 30-minute startup at 14.2 pounds of NO_x, 18.79 pounds of CO, and 1.6 pounds of POC, which the District is proposing as BACT limits on the emissions for startups. The District calculated these emission rates by taking the emissions performance that the manufacturer estimates the turbines could achieve for the first 10 minutes in a typical startup as summarized in Table 27, and then assuming that emissions are at the maximum uncontrolled rate for 14 minutes, and then at the maximum controlled rate for 6 minutes. In other words, the emissions would be uncontrolled for the initial 24 minutes. This is a conservative limit because if a startup takes longer than the manufacturer's estimate of 10 minutes, emissions will still have to reach the controlled level within 24 minutes. Using this conservative approach, the District calculated maximum emission rates for startups as set forth in Table 28 below:

TABLE 28. PROPOSED STARTUP EMISSION LIMITS FOR A 30-MINUTE STARTUP	
Pollutant	Typical Startup - Estimated Emissions (Pounds Per Event Per Turbine Per Startup)
NO _x as (NO ₂)	14.2
CO	18.79
POC	1.6

Note: Please check appendix A for detail calculations for pounds per event

In addition, in order to protect hourly air quality standards, the District is also proposing an additional hourly limit for operating hours during which startups occur. This limit is based on a reasonable need for the facility to start up twice in a one-hour period, which is not unforeseeable given the facility's operation as a peaker facility. The District is basing this proposed limit on two startups with a typical emissions profile as summarized in Table 27, using the following scenario: The first startup will last 10 minutes, followed by an 8 minute shutdown. The turbine would start up again for a total of 24 minutes, and the remainder of the hour (18 minutes) will be at steady-state BACT levels. These maximum hourly emissions with two startups are summarized in Table 29 below.

TABLE 29 MAXIMUM HOURLY PERMIT LIMITS FOR STARTUPS	
Pollutant	Maximum Startup Emissions (lb/hour)
NO _x as (NO ₂)	21.276
CO	25.26
POC	2.01

The Air District has concluded that using best work practices, the proposed simple-cycle gas turbines will be able to meet the startup permit limits shown above. The basis for these limits is emissions information provided by the gas turbine supplier General Electric.

Shutdowns

General Electric, the gas turbine manufacturer, supplied the following emission estimates for a typical shutdown occurring over 8 minutes.

TABLE 30. SIMPLE-CYCLE GAS TURBINES SHUTDOWN EMISSION ESTIMATES FOR FINAL 8 MINUTES

	Typical Shutdown - Estimated Emissions (Pounds Per Period Per Turbine Per Shutdown)
Pollutant	(lb/event)
NO _x as (NO ₂)	2.7
CO	2.4
POC	0.047

The Air District proposes to have maximum pound-per-event limits for shutdowns. The District estimates over the life of the facility that a given shutdown may take as long as 15 minutes to allow the gas turbine time to ramp down from full load operation and allow time for the turbine to decelerate after fuel flow stops. Each shutdown would be limited to a maximum of 15 minutes for a worst-case shutdown.

The District then conservatively estimated the emissions during a 15-minute shutdown using an approach similar to the approach for estimating maximum startup emissions above. The District conservatively assumed that emissions that the typical shutdown emissions as summarized in Table 31 occur over the first 8 minutes of the shutdown, and that the rest of the 7-minute shutdown period had emissions at normal steady-state emissions rates. These are the worst-case pound-per-event values for the simple-cycle gas turbines during a shutdown.

TABLE 31. PROPOSED SHUTDOWN EMISSION LIMITS FOR A 15 MINUTE SHUTDOWN

	Typical Shutdown - Estimated Emissions (Pounds Per Event Per Turbine Per Shutdown)
Pollutant	(lb/event)
NO _x as (NO ₂)	3.2
CO	2.65
POC	0.117

Thus, the Air District has concluded that using best work practices, the proposed simple-cycle gas turbines will be able to meet the permit limits shown above in Table 28, Table 29 and Table 31.

Conclusion

The Air District is proposing stringent emission limits for startups and shutdowns conditions that can reasonably be achieved by the proposed Mariposa Energy Project, based on a review of the gas turbine supplier's emission estimates.

Emissions from specific startup and shutdown events may be significantly less than the proposed not-to-exceed permit limits, given the great variability of such events. The District is proposing to require the limits described above as the enforceable BACT limits to ensure that emissions are minimized to the greatest extent feasible while ensuring that the limits are achievable under all operating circumstances.

5.8 Best Available Control Technology During Commissioning of Gas Turbines

The simple-cycle gas turbines and associated equipment are highly complex and have to be carefully tested, adjusted, tuned and calibrated after the facility is constructed. These activities are generally referred to as “commissioning” of the facility. During the commissioning period, each of the combustion turbine generators needs to be fine-tuned at zero load, partial load, and full load to optimize its performance. The water injection system also needs to be tuned to ensure that the turbines run efficiently while meeting both the performance guarantees and emission guarantees. In addition, the selective catalytic reduction (SCR) systems and oxidation catalysts need to be installed and tuned.

The simple-cycle gas turbines will not be able to meet the stringent BACT limits for normal operations during the commissioning period for a number of reasons. First, the SCR systems and oxidation catalysts cannot be installed immediately when the turbines are initially started up. There may be oils or lubricants in the equipment from the manufacture and installation of the equipment, which would damage the catalysts if they were installed immediately. Instead, the turbines need to be operated without the SCR systems and oxidation catalysts for a period of time to burn off any impurities that may be left in the equipment. In addition, once all of the pollution control equipment is installed, it needs to be tuned in order to achieve optimum emissions performance. Until the equipment is tuned, it will not be able to achieve the very high levels of emissions reductions reflected in the stringent BACT limits for normal operations.

Because the BACT limits established for normal operations are not technically feasible during the commissioning period, these limits are not BACT for this phase of the facility’s operation. Alternate BACT limits must therefore be specified for this mode of operation. To do so, the Air District has conducted an additional BACT analysis specifically for the required commissioning activities.

The only control technology available for limiting emissions during commissioning is to use best work practices to minimize emissions as much as possible during commissioning, and to expedite the commissioning process so that compliance with the stringent BACT limits for normal operations can be achieved as quickly as possible. There are no add-on control devices or other technologies that can be installed for commissioning activities.

To implement best work practices as an enforceable BACT requirement, the Air District is proposing conditions that will require the simple-cycle gas turbines to minimize emissions to the maximum extent possible during commissioning. The Air District is also proposing numerical emissions limits based upon the equipment manufacturer’s best estimates of uncontrolled emissions at the operating loads that the simple-cycle gas turbines will experience during

commissioning. The proposed permit conditions will limit emissions to below the following levels:²⁴

TABLE 32. COMMISSIONING PERIOD EMISSIONS LIMITS FOR ONE SIMPLE-CYCLE GAS TURBINE		
Air Pollutant	Proposed Commissioning Period Emissions Limits for One Simple-Cycle Gas Turbine	
	lb/hr	lb/day
NO ₂	136	884
CO	96.2	589.6
POC		63.36
PM ₁₀		50
SO ₂		18.2

Notes: Please see Appendix A for detail lb/hr and lb/day commissioning emission estimates. NO₂ daily maximum assumes 8 hours of gas turbine testing at 10% load, 8 hours of Pre-Catalyst Initial tuning at 50-100% load and 8 hours of Post-Catalyst tuning at 50-100% load

Table 32 does not have lb/hr limits for of emissions POC, PM₁₀ and SO₂ because these pollutants are not continuously monitored for those pollutants.

Commissioning emissions will also be subject to the annual emissions limits applicable to normal operations. All emissions from commissioning activities will be counted towards the facility's annual limits. Because commissioning is a relatively short-term period, the facility should be able to stay within those limits over the course of the entire year. Counting commissioning emissions towards the annual limits will also provide an additional incentive for the facility operator to minimize emissions as much as possible.

The Air District is also proposing permit conditions to minimize the duration of commissioning activities. The proposed conditions require the facility to tune the combustion turbine to minimize emissions at the earliest feasible opportunity; and to install, adjust and operate the SCR systems and oxidation catalysts at the earliest feasible opportunity. The Air District is also proposing to cap the total amount of time that each turbine can operate partially abated and/or without the SCR systems and oxidation catalysts at 200 hours. This limit represents the shortest amount of time in which the facility can reasonably complete the required commissioning activities without jeopardizing safety and equipment warranties. The proposed 200-hour limit is based on the following estimates from General Electric of the time it will take for each specific commissioning activity.

²⁴ See Appendix A for Commissioning Emissions.

TABLE 33. COMMISSIONING SCHEDULE FOR A SINGLE SIMPLE-CYCLE GAS TURBINE ¹								
Activity	Duration (hours/Day)	Days	Load Range (%)	Total Emissions				
				NO _x (lbs/hr)	CO (lb/hr)	VOC (lb/hr)	Sox ² (lb/hr)	PM ₁₀ ² (lb/hr)
Initial Load Testing and Engine Checkout ³	4	2	10%	51	45	4.48	0.91	2.5
Pre-Catalyst Initial tuning ⁴	8	9	50-100%	51	45	4.48	0.91	2.5
Post- Catalyst tuning ⁴	8	15	50-100%	34	6.2	1.2	0.91	2.5
Notes: ¹ Assumes SCR and oxidation catalyst will limit emissions to BACT levels during the final tuning period, which includes performance test. ² Steady state controlled emission rates for Sox and PM10 are 0.91, and 2.5 lbs/hr respectively. These rates have been used to conservatively estimate hourly and total emissions during commissioning. ³ In synchronized operation followed by low load engine check. ⁴ Includes the period both before and after SCR and CO catalyst loading. Post-catalyst period includes NO _x and CO catalyst use.								

TABLE 34. COMMISSIONING SCHEDULE FOR FOUR SIMPLE-CYCLE GAS TURBINES								
Activity	Duration (hours/Day)	Days	Number of Turbines	Total Emissions				
				NO _x Total lbs	CO Total lb	VOC Total lb	Sox ² Total lb	PM ₁₀ Total lb
Initial Load Testing and Engine Checkout ³	4	2	4	1632	1440	143	29	80
Pre-Catalyst Initial tuning ⁴	8	9	4	14688	12960	1290	262	720
Post-Catalyst tuning ⁴	8	15	4	16320	2976	576	437	1200
Total in lbs				32640	17376	2010	728	2000
Total in tons				16.3	8.7	1.0	0.36	1.0
Total Hours for 4-turbines	800							
Notes: ¹ Assumes SCR and oxidation catalyst will limit emissions to BACT levels during the final tuning period, which includes performance test. ² Steady state controlled emission rates for Sox and PM10 are 0.91 and 2.5 lbs/hr respectively. These rates have been used to conservatively estimate hourly and total emissions during commissioning. ³ In synchronized operation followed by low load engine check. ⁴ Includes the period both before and after SCR and CO catalyst loading. Post-catalyst period includes NO _x and CO catalyst use.								

Compliance with these proposed conditions for the commissioning period will be monitored by continuous emissions monitors that the applicant will be required to install before any commissioning work begins, and through a written commissioning plan laying out all commissioning activities in advance, which the applicant will be required to submit to the Air District for review and approval.

5.9 Best Available Control Technology for Fire Pump Engine

The fire pump engine is subject to Best Available Control Technology for NO_x and CO because the engine will emit more than 10 lb/highest day of both NO_x and CO. BACT for emergency engines has been determined and published in the District's BACT/TBACT Workbook because the District issues permits to many emergency engines every year.

The District's BACT limit for NO_x is equivalent to the current EPA standard in 40 CFR 89. At this time, for a 220-hp engine, the limit for NO_x + NMHC combined is 3.0 g/bhp-hr.

The District's BACT limit for CO is the lower of 2.75 g/bhp-hr or the current EPA standard in 40 CFR 89. At this time, for a 220-hp engine, the limit for CO in 40 CFR 98 is 2.6 g/bhp-hr.

As shown in Section 4.1.4 of this PDOC, the engine complies with the BACT NO_x and CO limits.

6 Offsets Required by Pollutant

District regulations require that new facilities must provide Emission Reduction Credits (ERCs) to offset the increases in air emissions that they will cause. ERCs are generated when old facilities sources are shut down, or when sources are controlled below regulatory limits. The emissions reductions granted by the District are used to offset the increases from new facilities, so that there will be no overall increase in emissions from facilities subject to this offset program.

Pursuant to Regulation 2-2-302, federally enforceable emission offsets are required for POC and NO_x emission increases from permitted sources at facilities that will emit 10 tons per year or more on a pollutant-specific basis. For facilities that will emit more than 35 tons per year of NO_x offsets must be provided by the applicant at a ratio of 1.15 to 1.0. Pursuant to Regulation 2-2-302.2, POC offsets may be used to offset emission increases of NO_x.

The applicable offset ratios and the quantity of offsets required are summarized in Table 27.

6.1 NO_x Offsets

Because the proposed Mariposa Energy Project will emit greater than 35 tons per year of NO_x from permitted sources, the NO_x emissions must be offset at a ratio of 1.15 to 1.0 pursuant to District Regulation 2-2-302. The facility will emit up to 45.958 tons/yr of NO_x, and will therefore be required to provide offsets for 52.852 tons per year of NO_x emissions. The applicant has identified ERCs available for it to use sufficient to offset this level of NO_x emissions.

6.2 POC Offsets

Because the total POC emissions from permitted sources will not exceed 10 tons per year, the proposed Mariposa Energy Project is not required to offset its POC emissions under Regulation 2-2-302.

6.3 PM₁₀ Offsets

Because the total PM₁₀ emissions from permitted sources will not exceed 100 tons per year, the proposed Mariposa Energy Project is not required to offset its PM₁₀ emissions under District Regulation 2-2-303.

6.4 SO₂ Offsets

Pursuant to Regulation 2-2-303, emission reduction credits are not required for the SO₂ emission increases associated with this project since the facility's SO₂ emissions will not exceed 100 tons per year. Regulation 2-2-303 allows for the voluntary offsetting of SO₂ emission increases of less than 100 tons per year. The applicant has opted not to provide such emission offsets.

6.5 Offset Package

Table 35 summarizes the offset obligation of the proposed Mariposa Energy Project. The emission reduction credits presented in Table 23 exist as federally-enforceable, banked emission reduction credits that have been reviewed for compliance with District Regulation 2, Rule 4, “Emissions Banking”, and were subsequently issued as banking certificates by the District under the certificates cited in the Tables below. If the quantity of offsets issued under any certificate exceeded 35 tons per year for any pollutant, the application was required to fulfill the public notice and public comment requirements of District Regulation 2-4-405. Accordingly, such applications were reviewed by the California Air Resources Board, U.S. EPA, and adjacent air pollution control districts to insure that all applicable federal, state, and local regulations were satisfied.

As indicated below, Owens Corning Insulating Systems, LLC, is in possession of valid emission reduction credits to offset the emission increases from the permitted sources for the Mariposa Energy Project.

TABLE 35. EMISSION REDUCTION CREDITS IDENTIFIED BY Owens Corning Insulating Systems, LLC (TON/YR)	
Emissions	NO _x ^b
Valid Emission Reduction Credits ^a	55.9
Permitted Source Emission Limits	45.67
Offsets Required	52.52

^a From Banking Certificates 1182

^b Reflects applicable offset ratio of 1.15:1.0 pursuant to Regulation 2-2-302

TABLE 36. LOCATION OF CERTIFICATES HELD BY Owens Corning Insulating Systems, LLC				
Current Certificate	Original Certificate	Company	Location	Original Issue Dates
1182	564	Owens Corning Insulating Systems, LLC	Santa Clara	12/29/03

Note: The numbers of each certificate change with each transaction in the emissions bank. Certificate numbers below are the original certificates when the emission reduction was generated.

Certificate 564 was generated by modifying the M-Electric and O-Electric Furnaces.

7 Health Risk Screening Analysis

Pursuant to the BAAQMD Risk Management Regulation 2, Rule 5, a health risk screening must be conducted to determine the potential impact on public health resulting from the worst-case emissions of toxic air contaminants (TACs) from the proposed Mariposa Energy Project. The potential TAC emissions (both carcinogenic and non-carcinogenic) from the Mariposa Energy Project are summarized in Table 15 in Section 4.0. Table 38 presents the Health Risk Assessment Results for the Mariposa Energy Project. In accordance with the requirements of District Regulation 2, Rule 5 and California Office of Health Hazard Assessment (OEHHA) guidelines, the impact on public health due to the emission of these compounds was assessed utilizing EPA approved air pollutant dispersion models.

TABLE 37 HEALTH RISK ASSESSMENT RESULTS			
Receptor	Cancer Risk	Non-cancer Hazard Index (HI)	Max. Acute Non-cancer HI
Resident	0.3 in a million	0.015	N/A
Worker	1.3 in a million	0.001	N/A
Any	N/A	N/A	0.026

The health risk assessment has been prepared by the District Toxics Evaluation Section pursuant to BAAQMD Regulation 2, Rule 5. The increased carcinogenic risk attributed to this project is 1.3 in one million. Almost all of the worker cancer risk is due to S5, Fire Pump. This risk is considered acceptable in accordance with Section 2-5-301, because S5, Fire Pump, complies with the requirement for Best Available Control Technology for Toxics (TBACT). For an emergency engine, TBACT is a particulate emission rate lower than 0.15 gr/bhp.

The chronic hazard index and the acute hazard index attributed to the emission of non-carcinogenic air contaminants are not significant since they are less than 1.0.

Therefore, the proposed Mariposa energy Project will be in compliance with District Regulation 2, Rule 5. Please see Appendix B (Memo dated August 11, 2010 prepared by Ted Hull, Air Toxics Section) for further discussion.

8 Other Applicable Requirements

8.1 Applicable District Rules and Regulations

Regulation 1, Section 301: Public Nuisance

None of the project's sources of air contaminants are expected to cause injury, detriment, nuisance, or annoyance to any considerable number of persons or the public with respect to any impacts resulting from the emission of air contaminants regulated by the District.

Regulation 2, Rule 1, Sections 301 and 302: Authority to Construct and Permit to Operate

Pursuant to Sections 2-1-301 and 2-1-302, the applicant has submitted an application to the District to obtain an Authority to Construct and Permit to Operate for all regulated sources at the proposed Mariposa Energy Project. Those permits will be issued after the CEC completes its licensing process.

Regulation 2, Rule 1, Section 412: Public Notice, Schools

The facility is not within 1000 feet of a school and therefore is not subject to Section 2-1-412.

Regulation 2, Rule 2: New Source Review

The primary requirements of New Source Review that apply to the proposed Mariposa Energy Project are Section 2-2-301; "Best Available Control Technology Requirement", Section 2-2-302; "Offset Requirements, Precursor Organic Compounds and Nitrogen Oxides, NSR", Section 2-2-303, "Offset Requirement, PM₁₀ and Sulfur Dioxide, NSR".

Regulation 2, Rule 2, Section 301: BACT

The District has performed a BACT analysis for NO_x, CO, POC, PM₁₀/PM_{2.5} and SO_x as shown in Section 6. The proposed Mariposa Energy Project meets the BACT requirements under Section 2-2-301.

Regulation 2, Rule 2: Sections 302 and 303

The District has presented the offsets for the project for NO_x, POC, and PM₁₀ as shown in Section 7. The proposed Mariposa Energy Project meets the offset requirements under Sections 2-2-302 and 2-2-303.

Regulation 2, Rule 2: Sections 304, 305, 306 and 414

The proposed Mariposa Energy Project will not be subject to these requirements because it will not emit more than 100 tons per year of any air pollutant and because it will not exceed the thresholds for non-criteria pollutants in Section 306.

Regulation 2, Rule 3: Power Plants

Pursuant to Section 2-3-304, this Preliminary Determination of Compliance is subject to the public notice, public comment, and public inspection requirements contained in Sections 2-2-406 and 407. This document presents the Preliminary Determination of Compliance for the project. The District will consider all comments received during the comment period prior to issuing any Final Determination of Compliance for the project. The Final Determination of Compliance will be relied upon by the CEC in their licensing amendment proceeding. If the CEC grants a license to the project, then the District may issue an Authority to Construct.

Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants

A risk screening analysis was performed to estimate the health risk resulting from the toxic air contaminant (TAC) emissions from the proposed Mariposa Energy Project. The analysis is attached in Appendix B. It is also discussed in Section 7 of this PDOC. Results from this analysis indicate that the maximally exposed individual cancer risk is estimated at 1.3 in a million, the chronic non-cancer hazard index at 0.015 in a million, and the acute non-cancer hazard index at 0.026 in million. Therefore, the proposed Mariposa Energy Project will be in compliance with the requirements of Section 2-5-301.

Regulation 2, Rule 6: Major Facility Review

After construction, the facility will be subject to Regulation 2, Rule 6, which implements the Title V program of the Federal Clean Air Act and 40 CFR 70, State Operating Permit Programs.

Pursuant to Section 404.1, the owner/operator of the Mariposa Energy Project shall submit an application to the District for a major facility review permit within 12 months after the facility becomes subject to Regulation 2, Rule 6. Pursuant to Sections 2-6-212.1 and 2-6-218, the Mariposa will become subject to Regulation 2, Rule 6, upon completion of construction as demonstrated by first firing of the gas turbines.

Regulation 2, Rule 7: Acid Rain

District Regulation 2, Rule 7 incorporates the provisions of 40 CFR Part 72 by reference. 40 CFR 72 through 78 implements Title IV, Acid Rain, of the Federal Clean Air Act. These requirements are discussed in more detail in Section 8.3 of this PDOC, Federal Requirements.

Regulation 6, Rule 1: Particulate Matter – General Requirements

Through the use of proper combustion practices, the combustion of natural gas at the gas turbines is not expected to result in visible emissions. Specifically, the facility's combustion sources are expected to comply with Sections 301 (Ringelmann No. 1 Limitation), and 310 (Particulate Weight Limitation) with particulate matter emissions of less than 0.15 grains per dry standard cubic foot of exhaust gas volume. As calculated in accordance with Section 310, the grain loading resulting from the operation of each gas turbine is 0.0012 gr/dscf @ 15% O₂. See Appendix A for simple-cycle gas turbine grain loading calculations.

Particulate matter emissions associated with the construction of the facility are exempt from District permit requirements, but are subject to Regulation 6, Rule 1. However, the California Energy Commission will impose requirements for construction activities including the use of water and/or chemical dust suppressants to minimize PM₁₀ emissions and prevent visible particulate emissions.

Regulation 7: Odorous Substances

Section 302 prohibits the discharge of odorous substances, which remain odorous beyond the facility property line after dilution with four parts odor-free air. Section 303 limits ammonia emissions to 5000 ppm. Because the ammonia slip emissions from the turbines will be limited by permit condition to 5 ppmvd @ 15% O₂ respectively, the facility is expected to comply with the requirements of Regulation 7.

Regulation 8: Organic Compounds

The gas turbines are exempt from Regulation 8, Rule 2, “Miscellaneous Operations” Section 110 since natural gas will be fired exclusively at those sources.

The use of solvents for cleaning and maintenance at the Mariposa Energy Project is expected to be at a level that is exempt from permitting in accordance with Regulation 2, Rule 1, Section 118. The facility may utilize less than 20 gallons per year of solvent for wipe cleaning per Section 118.9 and remain exempt from permitting requirements. The facility may also utilize a cold cleaner for maintenance cleaning as long as the unit meets the exemption set forth in Section 118.4. The facility may also perform solvent cleaning and preparation-using aerosol cans meeting the exemption set forth in Section 118.10. Any solvent usage exceeding the amounts in Section 118 would require a permit. In addition, any solvent usage in excess of a toxic air contaminant trigger level contained in Regulation 2, Rule 5 would require a permit.

Regulation 9: Inorganic Gaseous Pollutants

Regulation 9, Rule 1, Sulfur Dioxide

This regulation establishes emission limits for sulfur dioxide from all sources and applies to the combustion sources at this facility. Section 301 (Limitations on Ground Level Concentrations) prohibits emissions, which would result in ground level SO₂ concentrations in excess of 0.5 ppm continuously for 3 consecutive minutes, 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours. Section 302 (General Emission Limitation) prohibits SO₂ emissions in excess of 300 ppmv (dry). With maximum projected SO₂ emissions of < 1 ppmv, the gas turbines are not expected to cause ground level SO₂ concentrations in excess of the limits specified in Section 301 and should easily comply with Section 302.

Regulation 9, Rule 7, Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters

The simple-cycle gas turbines are not subject to Regulation 9, Rule 7 requirements.

Regulation 9, Rule 9, Nitrogen Oxides from Stationary Gas Turbines

Because each of the combustion gas turbines will be limited by permit condition to NO_x emissions of 2.5 ppmvd @ 15% O₂, they will comply with the NO_x limitation in Section 301.2 of 9 ppmvd @ 15% O₂ or 0.43 lb/MW-hr.

Regulation 10: Standards of Performance for New Stationary Sources

Generally Regulation 10 incorporates by reference the provisions of Title 40 CFR Part 60. However, the District has not sought delegation of the New Source Performance Standard (NSPS) contained in Subparts IIII or KKKK.

Subpart IIII, “Standards of Performance for Stationary Compression Ignition Internal Combustion Engines” applies to the fire pump engine. The engine will comply with all applicable standards and limits required by these regulations. The applicable emission limitations are summarized in Section 9.3.

Subpart KKKK, “Standards of Performance for Stationary Gas Turbines” applies to this facility. The gas turbines will comply with all applicable standards and limits required by these regulations. The applicable emission limitations are summarized in Section 9.3.

8.2 State Requirements

The proposed Mariposa Energy Project will be subject to the Air Toxic “Hot Spots” Program contained in the California Health and Safety Code Section 44300 et seq. The facility will be required to prepare inventory plans and reports as required.

The fire pump engine, S5, will be subject to the Stationary Diesel Engine ATCM contained in Title 17, Public Health, California Code of Regulations section 93115 et seq. The engine family (9CEXL0409AAB) has been certified by CARB and the engine will comply with the emission requirements for new emergency standby diesel-fueled compression ignition engines in Section 93115(a)(3)(A), which are:

- NMHC + NO_x < 3 g/bhp-hr
- CO < 2.6 g/bhp-hr
- PM < 0.15 g/bhp-hr

The engine will be subject to BAAQMD Standard Condition 22850, which has a limit of 50 hours/yr operation for maintenance and testing and other ATCM requirements.

The facility will be subject to the California Accidental Release regulations because the facility will inject a solution containing 19% ammonia into the selective catalytic reduction systems for NO_x control. These regulations are contained in California Code of Regulations, title 19, section 2735, *et seq.*

The turbines will not be subject to the requirements in California Code of Regulations, title 20, sections 2900, *et seq.*, because they are not base-loaded turbines. The definition of “baseload generation” in Section 2901(b) states that “ ‘Baseload generation’ means electricity generation from a powerplant that is designed and intended to provide electricity at an annualized plant capacity factor of at least 60 percent”, which is equivalent to 5,256 hours/any consecutive 12 months. Since these turbines are intended to run about 4,225 hours/any consecutive 12 months, they will not be subject. A permit condition limiting operation of any single turbine for more than 5,200 hours/any consecutive 12 months has been added to part 15b of Condition _____.

The facility will be subject to the mandatory greenhouse gas reporting requirements contained in Title 17, California Code of Regulations section 95100, *et seq.*, and is expected to comply with these requirements.

8.3 Federal Requirements

40 CFR Part 52.21, Prevention of Significant Deterioration of Air Quality

The facility will not be subject to these requirements because it will not be a “major stationary source” as defined in Section 52.21(b)(1)(i)(a). The facility would be a major stationary source for the purposes of this requirement if its potential to emit were over 250 tons per year of any regulated air pollutant.

On June 3, 2010, EPA promulgated the “Tailoring Rule,” which contains amendments to 40 CFR Part 52.21. On July 1, 2011, greenhouse gases will become subject to regulation if a facility has the potential to emit more than 100,000 tons per year of carbon dioxide equivalents as defined by 40 CFR 52.21(b)(49)(i)-(v). MEP will emit more than the threshold, but will not be subject to 40 CFR 52.21 if construction commences before July 1, 2011.

40 CFR Part 60 Subpart KKKK

Subpart KKKK “Standards of Performance for Stationary Gas Turbines” applies to this facility. The gas turbines will comply with all applicable standards and limits required by these regulations. The applicable emission limitations are summarized below:

TABLE 38. NEW SOURCE PERFORMANCE STANDARDS FOR SIMPLE-CYCLE GAS TURBINES

Source	Requirement	Emission Limitation	Compliance Demonstration
Gas Turbines	Subpart GG	Not Applicable	
	Subpart KKKK	1.2 lb NO _x /MW-hr, or 25 ppm NO _x as NO ₂ @ 15% O ₂ ; 0.9 lb SO ₂ /MW-hr, or 0.06 lb SO ₂ /MMBtu maximum No CO limit in Subpart KKKK No PM limit in Subpart KKKK	2.5 ppm NO _x as NO ₂ @ 15% O ₂ Permit Limit; 0.0028 lb/MMBtu of SO ₂ Permit Limit

Section 60.4375 requires submittal of reports of excess emissions and monitoring of downtime for all periods of unit operation, including startup, shutdown, and malfunction. The applicant is expected to maintain adequate records for Subpart KKKK reporting requirements. The gas turbines will be equipped with continuous emissions monitors for NO_x. An annual NO_x emission test will not be required for Subpart KKKK as long as a compliant CEM is used to monitor emissions.

No sulfur content monitoring of the natural gas is required by Subpart KKKK if the facility demonstrates the fuel meets the sulfur content requirements contained in Section 60.4365 using the information required by Section 60.4365(a).

40 CFR Part 60, Subpart IIII

The fire pump engine is subject to the requirements of Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. It is expected to comply because the engine family (9CEXL0409AAB) has been certified by CARB to meet the emission limits in Table 4 of the standard, which are:

- NMHC + NO_x < 3 g/bhp-hr
- CO < 2.6 g/bhp-hr
- PM < 0.15 g/bhp-hr

40 CFR Part 63 Subpart YYYY

Subpart YYYY contains the National Emission Standards for Hazardous Air Pollutants (NESHAPS) for Stationary Combustion Turbines. This regulation does not apply to the Mariposa Energy Project because it will not emit more than 10 tons per year of a hazardous air

pollutant (HAP) or more than 25 tons per year of a combination of hazardous air pollutants. Note that the Federal Clean Act does not define ammonia and sulfuric acid as HAPs.

The detail of the estimated HAP emissions is found in Section 4.2 of this PDOC.

40 CFR 64, Compliance Assurance Monitoring (CAM)

Requirements for enhanced monitoring may apply to facilities that are required to obtain Part 70 (Title V or Major Facility Review) permits. If applicable, the requirements would apply at the time of issuance of the Major Facility Review permit. Although these requirements would not apply at the completion of construction, it is prudent to determine at this time if they will apply so that it can be determined whether the monitoring strategy would comply with CAM.

In general, the requirement applies if an emission unit, as defined in Section 64.1, is subject to a federally-enforceable emission limit for a pollutant, has emissions of the pollutant that are greater than the major source thresholds (100 tpy of any regulated air pollutant or 10 tpy of a HAP) and the emissions of that pollutant are abated by a control device. There are several exemptions.

In this case, NO_x and CO are controlled by SCR and a CO catalyst.

Monitoring for the NO_x limits is exempt in accordance with 40 CFR 64.2(b)(iii) because the monitoring is subject to the Acid Rain monitoring requirements in 40 CFR 75.

Monitoring for the CO limits is required if the potential to emit of CO before control is more than 100 tons/yr.

The potential to emit is calculated using the following parameters:

Hours of steady state operation: 4000 hr/yr

CO concentrations at steady state operation depending on the ambient temperature:²⁵

17F 53.2 ppmv CO before control

46F 20.9 ppmv CO before control

59F 15 ppmv CO before control

93F 7.6 ppmv CO before control

An average concentration of 24.2 ppmv CO before control will be assumed.

Fuel input: 481 MMbtu/hr

lb-mol CO = 28 lb CO

8710 scf flue gas/MMbtu @ 0% O₂

30,668 scf flue gas/MMbtu @ 15% O₂

385.3 dscf/lbmol

14.1 lb/startup

2.9 lb/shutdown

300 startups and shutdowns per year

Commissioning emissions: 0.18 tons CO/yr

²⁵ Check Table 1 for CO ppmv before control.

$$(481 \text{ MMbtu/hr}) (30,668 \text{ dscf/MMbtu}) (\text{lbmol}/385.3 \text{ dscf}) (24.2 \text{ ppm}/10^6) (28 \text{ lb CO/lbmol}) \\ = 25.9 \text{ lb CO/hr}$$

At 4000 hr/yr:
= 51.88 tpy CO/turbine for steady state operations

Including startup, shutdown, and commissioning:
51.88 tpy + ((14.1 lb/event + 2.9 lb/event) x 300 events/yr) x (ton/2000 lb)
+ 0.18 tpy CO = 54.63 tpy CO before control

Because the CO emissions for each turbine will be less than 100 ton/year before control, the turbines are not subject to the requirements of 40 CFR 64.

40 CFR Part 68

This part regulates the unanticipated emission of an extremely hazardous substance into the ambient air from a stationary source. The ammonia used by Mariposa Energy Project is below the Federal thresholds, therefore the facility will not be subject to these requirements.

40 CFR Part 70, State Operating Permit Programs

These requirements are discussed in Section 8.2 under Regulation 2, Rule 6: Major Facility Review, which implements Part 70.

40 CFR Parts 72 Through 78, Acid Rain

The Mariposa gas turbine units will be subject to the requirements of Title IV of the federal Clean Air Act. The requirements of the Acid Rain Program are outlined in 40 CFR Part 72. The specifications for the type and operation of continuous emission monitors (CEMs) for pollutants that contribute to the formation of acid rain are given in 40 CFR Part 75.

40 CFR Part 72, Subpart A - Acid Rain Program

Part 72, Subpart A, establishes general provisions and operating permit program requirements for sources and affected units under the Acid Rain program, pursuant to Title IV of the Clean Air Act. The gas turbines are affected units subject to the program in accordance with 40 CFR Part 72, Subpart A, Section 72.6(a).

40 CFR Part 72, Subpart C – Acid Rain Permit Applications

Part 72, Subpart C, requires that the applicant submit a complete Acid Rain Permit application 24 months prior to first firing of the gas turbines.

40 CFR Part 73 – Sulfur Dioxide Allowance System

Part 73 establishes the sulfur dioxide allowance system for tracking, holding, and transferring allowances. The applicant will be required to obtain sufficient SO₂ allowances for each operating year on March 1st (or February 29th in a leap year) of the following year.

40 CFR Part 75 – Continuous Emission Monitoring

Part 75 contains the continuous emission monitoring requirements for units subject to the Acid Rain program. The applicant will be required to meet the Part 75 requirements for monitoring, recordkeeping and reporting of SO₂, NO_x, and CO₂ emissions.

40 CFR Part 98

This part establishes mandatory greenhouse gas (GHG) reporting requirements for owners and operators of certain facilities that directly emit GHG. The applicant will be required to meet Part 98 requirements for reporting recordkeeping and monitoring the CO₂ emissions year-round through 40 CFR Part 75.

8.4 Greenhouse Gases

Climate change poses a significant risk to the Bay Area with such impacts such as rising sea levels, reduced runoff from snow pack in the Sierra Nevada, increased air pollution, impacts to agriculture, increased energy consumption, and adverse changes to sensitive ecosystems. The generation of electricity from burning natural gas produces air emissions known as greenhouse gases (GHGs) in addition to the criteria air pollutants. GHGs are known to contribute to the warming of the earth's atmosphere. These include primarily carbon dioxide, nitrous oxide (N₂O, not NO or NO₂, which are commonly known as NO_x or oxides of nitrogen), and methane (unburned natural gas). Also included are sulfur hexafluoride (SF₆) from transformers, and hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) from refrigeration chillers.

The California Global Warming Solutions Act of 2006 (AB32) requires the California Air Resources Board (ARB) to adopt a statewide GHG emissions limit equivalent to the statewide GHG emissions levels in 1990 to be achieved by 2020. To achieve this, ARB has a mandate to adopt rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emission reductions.

The ARB is expected to adopt early action GHG reduction measures in the near future to reduce greenhouse gas emissions by 2020. ARB has adopted regulations requiring mandatory GHG emissions reporting. The facility is expected to report all GHG emissions to meet ARB requirements.

The facility will also be required to report GHG emissions to CARB, the District, and US EPA. In 2008, the District placed a fee on GHG emissions from large stationary sources of GHGs.

The GHG emissions estimates for Mariposa Energy Project are shown below.

Mariposa Energy Project has the potential to emit 430,240 metric tons/year of CO₂ equivalents using the ARB Mandatory Reporting Rule calculation methodology.

The Mariposa simple-cycle gas turbines will have a gross electrical efficiency of 40% at 59°F and a relative humidity of 60% (Efficiency estimate provided by Applicant).

The Mariposa simple-cycle gas turbines will have a heat rate of 8591 (LHV) Btu/Kw-hr at 59°F and a relative humidity of 60%.

The EPA Administrator has recently stated that by April of 2010, the Administrator will take actions to ensure that no stationary sources will be required to get a Clean Air Act permit to cover GHG emissions in calendar year 2010.²⁶ In addition, in the first half of 2011, only sources required by non-GHG emissions to obtain a permit under the Clean Air Act will need to address their GHG emission in their permit applications. Therefore, the Mariposa Energy Project is not required to address GHG emissions under the Clean Air Act at this time.

The California Energy Commission (CEC) is the primary permitting authority for new power plants in California. The California Legislature has granted the Energy Commission exclusive licensing authority for all thermal power plants in California of 50 megawatts or more. (See Warren-Alquist State Energy Resources Conservation and Development Act, Cal. Public Resources Code §§ 25000 et seq.) As the lead permitting agency, the CEC conducts an in-depth review of environmental and other issues posed by the proposed power plant. This comprehensive environmental review is the equivalent of the review required for major projects under the California Environmental Quality Act (CEQA), and the Energy Commission's license satisfies the requirements of CEQA for these projects. This CEQA-equivalent review encompasses air quality issues within the purview of the Air District, and also includes all other types of environmental and other issues, including water quality issues, endangered species issues, land use issues and Green House Gas issues, among others.

As the lead agency under the CEQA-equivalent process, the CEC will be required to quantify and assess GHG emissions from the Mariposa Energy Project to evaluate the facility's compliance with applicable laws, ordinances, regulations and standards, and the potential impacts and benefits associated with adding Mariposa Energy Project to the electricity system.

The GHG emissions estimates for the Mariposa Energy Project are shown below.

²⁶ Letter dated February 22, 2010 from Lisa Jackson to Senator Rockefeller, Letter summarizing EPA proposals on regulating green house gases

TABLE 39. ESTIMATED ANNUAL GHG EMISSIONS FROM MEP

	Fuel Usage, MMbtu/yr	Emission Factor, (kg CO2/MMbtu)	Emission Factor, (g CH4/MMbtu)	Emission Factor, (g N2O/MMbtu)	GHG (metric tons/yr)	Global Warming Potential	CO2 Equivalents (Metric tons/yr)
GHG							
Gas Turbines							
CO2	8,128,900	52.87			429775	1	429775
CH4	8,128,900		0.9		7	21	154
N2O	8,128,900			0.1	1	310	252
Engine	Fuel Usage, gal/yr, @ 500 hr/yr	Emission Factor, (kg CO2/gal)					
CO2	5,650	10.14			57	1	57
CH4	5,650		0.000416		0.0000	21	0
N2O	5,650			0.000083	0.0000	310	0
Circuit Breakers							
SF6					0.000075	23,900	2
Total							430240

Note:

Emission Factors from the REGULATION FOR THE MANDATORY REPORTING OF GREENHOUSE GAS EMISSIONS, Appendix A, Title 17, California Code of Regulations, Subchapter 10, Article 2, Sections 95100 to 95133

CO2 Emission Factor from Table 4 Appendix A-6 for Natural Gas with a heat content between 1000 Btu/scf and 1025 Btu/scf

CH4 Emission Factor from Table 6 Appendix A-9

N2O Emission Factor from Table 6 Appendix A-9

Global Warming Potentials from Table 2 Appendix A-4

Applicant estimates SF6 emissions for 1 circuit breaker at 0.15 lb/yr per unit (based on 0.1% leak rate for 150 lb SF6 per unit)

8.5 Environmental Justice

The District is committed to implementing its permit programs in a manner that is fair and equitable to all Bay Area residents regardless of age, culture, ethnicity, gender, race, socioeconomic status, or geographic location in order to protect against the health effects of air pollution. The District has worked to fulfill this commitment in the current permitting action.

The emissions from the proposed project will not cause or contribute to any significant public health impacts in the community. As described in detail above, the District has undertaken a detailed review of the potential public health impacts of the emissions authorized under the proposed permitting action, and has found that they will involve no significant public health risks. The District has found that the maximum lifetime cancer risk associated with the facility is 1.3 in one million, and that the maximum chronic Hazard Index would be 0.015 and the maximum acute Hazard Index would be 0.026. These risk levels are far below what the District, EPA, or any other public health agency considers to be significant. The District anticipates that there will be no significant impacts due to air emissions related to the Mariposa project after all of the mitigations required by District Rules and the California Energy Commission are implemented. District Rules require offsets for NO_x and POC emissions from this facility. The CEC will require numerous mitigation measures as part of the CEC licensing proceeding for the facility. The District does not anticipate an adverse impact on any community due to air emissions from the Mariposa project and therefore there is no disparate adverse impact on any Environmental Justice community located near the facility.

9 Permit Conditions

The District is proposing the following permit conditions to ensure that the project complies with all applicable District, state, and federal Regulations. The proposed conditions would limit operational parameters such as fuel use, stack gas emission concentrations, and mass emission rates. The permit conditions specify abatement device operation and performance levels. To aid enforcement efforts, conditions specifying emission monitoring, source testing, and record keeping requirements are included. Furthermore, pollutant mass emission limits (in units of lb/hr and lb/MMBtu of natural gas fired) will insure that daily and annual emission rate limitations are not exceeded.

To provide maximum operational flexibility, no limitations are being proposed on the type or quantity of gas turbine start-ups or shutdowns. Instead, the facility would be required to comply with daily and annual (consecutive twelve-month) mass emission limits at all times. Compliance with CO and NO_x limitations would be verified by continuous emission monitors (CEMs) that will be in operation during all turbine-operating modes, including start-up, shutdown, combustor tuning, and transient conditions. Compliance with POC, SO₂, and PM₁₀ mass emission limits would be verified by annual source testing.

In addition to permit conditions that apply to steady-state operation of each gas turbine power train, the District is proposing conditions that govern equipment operation during the initial commissioning period when the gas turbine power trains will operate without their SCR systems and/or oxidation catalysts in place. Commissioning activities include, but are not limited to, the testing of the gas turbines, and adjustment of control systems. Parts 1 through 10 of the proposed permit conditions for the simple-cycle gas turbines apply to this commissioning period and are intended to minimize emissions during the commissioning period.

Following are the proposed Mariposa Energy Project combustion equipment and the abatement devices regulated by the District.

Proposed Mariposa Energy Project Combustion Equipment and Abatement Devices

- S-1 Combustion Turbine Generator (CTG) #1, GE LM 6000 PC-Sprint, Natural Gas Fired, 48.5 MW, 481 MMBtu/hr maximum rated capacity (HHV); abated by A-1 Oxidation Catalyst and A-2 Selective Catalytic Reduction System (SCR).
- S-2 Combustion Turbine Generator (CTG) #2, GE LM 6000 PC-Sprint, Natural Gas Fired, 48.5 MW, 481 MMBtu/hr maximum rated capacity (HHV); abated by A-3 Oxidation Catalyst and A-4 Selective Catalytic Reduction System (SCR).
- S-3 Combustion Turbine Generator (CTG) #3, GE LM 6000 PC-Sprint, Natural Gas Fired, 48.5 MW, 481 MMBtu/hr maximum rated capacity (HHV); abated by A-5 Oxidation Catalyst and A-6 Selective Catalytic Reduction System (SCR).

- S-4 Combustion Turbine Generator (CTG) #4, GE LM 6000 PC-Sprint, Natural Gas Fired, 48.5 MW, 481 MMBtu/hr maximum rated capacity (HHV); abated by A-7 Oxidation Catalyst and A-8 Selective Catalytic Reduction System (SCR).
- S-5 Diesel Fire Pump: Make: Cummins; Model: CFP7E-F40; Model Year: TBD (2009 or later); Rated bhp: 220

Proposed Mariposa Energy Project Permit Conditions

Definitions:

Hour	Any continuous 60-minute period
Clock Hour:	Any continuous 60-minute period beginning on the hour
Calendar Day:	Any continuous 24-hour period beginning at 12:00 AM or 0000 hours
Year:	Any consecutive twelve-month period of time
Rolling 3-hour period:	Any consecutive three hour period, not including start-up or shutdown periods
Rolling 3-hour period for CO:	Any consecutive three-hour period, not including commissioning, start-up or shutdown periods. Rolling 3-hour periods shall be calculated for normal steady state operation. The minutes shall be summed across normal operating periods and days until 180 minutes have accrued. Compliance with the CO limit shall be based on this 3-hour period. After each 3-hour period has elapsed, a new 3-hour period begins every 60 minutes after the beginning of the previous 3-hour period.
Heat Input:	All heat inputs refer to the heat input at the higher heating value (HHV) of the fuel, in BTU/scf
Firing Hours:	Period of time during which fuel is flowing to a unit, measured in minutes
MMBtu:	million British thermal units
Gas Turbine Start-up Mode:	The lesser of the first 30 minutes of continuous fuel flow to the Turbine after fuel flow is initiated or the period of time from Gas Turbine fuel flow initiation until the Gas Turbine achieves two consecutive CEM data points in compliance with the emission concentration limits of conditions 17(b) and 17(d).
Gas Turbine Shutdown Mode:	The lesser of the 15 minute period immediately prior to the termination of fuel flow to the Gas Turbine or the period of time from non-compliance with any requirement listed in Conditions 17(b) and 17(d) until termination of fuel flow to the Gas Turbine

Gas Turbine Combustor Tuning Mode:	The period of time, not to exceed 8 hours, in which testing, adjustment, tuning, and calibration operations are performed, as recommended by the gas turbine manufacturer, to insure safe and reliable steady-state operation, and to minimize NO _x and CO emissions. The SCR and oxidation catalyst are not operating at their design control effectiveness during the tuning operation.
Specified PAHs:	The polycyclic aromatic hydrocarbons listed below shall be considered to be Specified PAHs for these permit conditions. Any emission limits for Specified PAHs refer to the sum of the emissions for all six of the following compounds Benzo[a]anthracene Benzo[b]fluoranthene Benzo[k]fluoranthene Benzo[a]pyrene Dibenzo[a,h]anthracene Indeno[1,2,3-cd]pyrene
Corrected Concentration:	The concentration of any pollutant (generally NO _x , CO, or NH ₃) corrected to a standard stack gas oxygen concentration. For emission points P-1 (exhaust of S-1 Gas Turbine), P-2 (exhaust of S-2 Gas Turbine) P-3 (exhaust of S-3 Gas Turbine), P-4 (exhaust of S-4 Gas Turbine), the standard stack gas oxygen concentration is 15% O ₂ by volume on a dry basis
Commissioning Activities:	All testing, adjustment, tuning, and calibration activities recommended by the equipment manufacturers and the MEP construction contractor to insure safe and reliable steady-state operation of the gas turbines, heat recovery steam generators, steam turbine, and associated electrical delivery systems during the commissioning period
Commissioning Period:	The Period shall commence when all mechanical, electrical, and control systems are installed and individual system start-up has been completed, or when a gas turbine is first fired, whichever occurs first. The period shall terminate when the plant has completed performance testing, is available for commercial operation, and has initiated sales to the power exchange.
Precursor Organic Compounds (POCs):	Any compound of carbon, excluding methane, ethane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate
CEC CPM:	California Energy Commission Compliance Program Manager
MEP:	Mariposa Energy Project
Total Particulate Matter:	The sum of all filterable and all condensable particulate matter.

Applicability:

Parts 1 through 10 of this condition shall only apply during the commissioning period as defined above. Unless otherwise indicated, Parts 11 through 38 of this condition shall apply after the commissioning period has ended.

Conditions for the Commissioning Period for GE LM 6000 PC Sprint Gas Turbines

1. The owner/operator of the MEP shall minimize emissions of carbon monoxide and nitrogen oxides from S-1, S-2, S-3 and S-4 Gas Turbines to the maximum extent possible during the commissioning period. (Basis: BACT, Regulation 2, Rule 2, Section 409)
2. At the earliest feasible opportunity in accordance with the recommendations of the equipment manufacturers and the construction contractor, the owner/operator shall tune the S-1, S-2, S-3 and S-4 Gas Turbines combustors to minimize the emissions of carbon monoxide and nitrogen oxides. (Basis: BACT, Regulation 2, Rule 2, Section 409)
3. At the earliest feasible opportunity in accordance with the recommendations of the equipment manufacturers and the construction contractor, the owner/operator shall install, adjust, and operate the A-1, A-3, A-5 and A-7 Oxidation Catalysts and A-2, A-4, A-6 and A-8 SCR Systems to minimize the emissions of carbon monoxide and nitrogen oxides from S-1, S-2, S-3, and S-4 Gas Turbines. (Basis: BACT, Regulation 2, Rule 2, Section 409)
4. The owner/operator of the MEP shall submit a plan to the District Engineering Division and the CEC CPM at least four weeks prior to first firing of S-1, S-2, S-3, and S-4 Gas Turbines describing the procedures to be followed during the commissioning of the gas turbines. The plan shall include a description of each commissioning activity, the anticipated duration of each activity in hours, and the purpose of the activity. The activities described shall include, but not be limited to, the tuning of the combustors, the installation and operation of the required emission control systems, the installation, calibration, and testing of the CO and NO_x continuous emission monitors, and any activities requiring the firing of the Gas Turbines (S-1, S-2, S-3 & S-4) without abatement by their respective oxidation catalysts and/or SCR Systems. The owner/operator shall not fire any of the Gas Turbines (S-1, S-2, S-3 or S-4) sooner than 28 days after the District receives the commissioning plan. (Basis: Regulation 2, Rule 2, Section 419)
5. During the commissioning period, the owner/operator of the MEP shall demonstrate compliance with Parts 7, 8, 9, and 10 through the use of properly operated and maintained continuous emission monitors and data recorders for the following parameters and emission concentrations:
 - firing hours
 - fuel flow rates
 - stack gas nitrogen oxide emission concentrations,
 - stack gas carbon monoxide emission concentrations

stack gas oxygen concentrations.

The monitored parameters shall be recorded at least once every 15 minutes (excluding normal calibration periods or when the monitored source is not in operation) for the Gas Turbines (S-1, S-2, S-3, and S-4). The owner/operator shall use District-approved methods to calculate heat input rates, nitrogen dioxide mass emission rates, carbon monoxide mass emission rates, and NO_x and CO emission concentrations, summarized for each clock hour and each calendar day. The owner/operator shall retain records on site for at least 5 years from the date of entry and make such records available to District personnel upon request. (Basis: Regulation 2, Rule 2, Section 419)

6. The owner/operator shall install, calibrate, and operate the District-approved continuous monitors specified in Part 5 prior to first firing of the Gas Turbines (S-1, S-2, S-3 and S-4). After first firing of the turbines, the owner/operator shall adjust the detection range of these continuous emission monitors as necessary to accurately measure the resulting range of CO and NO_x emission concentrations. The type, specifications, and location of these monitors shall be subject to District review and approval. (Basis: Regulation 2, Rule 2, Section 419)
7. The owner/operator shall not fire S-1, S-2, S-3, or S-4 Gas Turbine without abatement of nitrogen oxide emissions by the corresponding SCR System A-2, A-4, A-6, or A-8 and/or abatement of carbon monoxide emissions by the corresponding Oxidation Catalyst A-1, A-3, A-5, or A-7 for more than 200 hours each during the commissioning period. Such operation of any Gas Turbine (S-1, S-2, S-3, S-4) without abatement shall be limited to discrete commissioning activities that can only be properly executed without the SCR system and/or oxidation catalyst in place. Upon completion of these activities, the owner/operator shall provide written notice to the District Engineering and Enforcement Divisions and the unused balance of the 200 firing hours for each turbine without abatement shall expire. (Basis: BACT, Regulation 2, Rule 2, Section 409)
8. The total mass emissions of nitrogen oxides, carbon monoxide, precursor organic compounds, PM₁₀, and sulfur dioxide that are emitted by the Gas Turbines (S-1, S-2, S-3, and S-4) during the commissioning period shall accrue towards the consecutive twelve-month emission limitations specified in Part 20. (Basis: Regulation 2, Rule 2, Section 409)
9. The owner/ operator shall not operate the Gas Turbines (S-1, S-2, S-3, and S-4) in a manner such that the pollutant emissions from each gas turbine will exceed the following limits during the commissioning period. These emission limits shall include emissions resulting from the start-up and shutdown of the Gas Turbines (S-1, S-2, S-3, S-4). (Basis: BACT, Regulation 2, Rule 2, Section 409)

NO _x (as NO ₂):	3536 pounds per calendar day	204 pounds per hour
CO:	2358 pounds per calendar day	180 pounds per hour
POC (as CH ₄):	254 pounds per calendar day	
PM ₁₀ :	200 pounds per calendar day	
SO ₂ :	73 pounds per calendar day	

10. Within 90 days after startup, the Owner/Operator shall conduct District and CEC approved source tests to determine compliance with the emission limitations specified in Part 17. The source tests shall determine NO_x, CO, and POC emissions during start-up and shutdown of the gas turbines. The POC emissions shall be analyzed for methane and ethane to account for the presence of unburned natural gas. The source test shall include a minimum of three start-up and three shutdown periods. Thirty working days before the execution of the source tests, the Owner/Operator shall submit to the District and the CEC Compliance Program Manager (CPM) a detailed source test plan designed to satisfy the requirements of this Part. The District and the CEC CPM will notify the Owner/Operator of any necessary modifications to the plan within 20 working days of receipt of the plan; otherwise, the plan shall be deemed approved. The Owner/Operator shall incorporate the District and CEC CPM comments into the test plan. The Owner/Operator shall notify the District and the CEC CPM within seven (7) working days prior to the planned source testing date. The owner/operator shall submit the source test results to the District and the CEC CPM within 60 days of the source testing date. (Basis: Regulation 2, Rule 2, Section 419)

Conditions for the GE LM 6000 PC Sprint Simple-Cycle Gas Turbines (S-1, S-2, S-3, and S-4)

11. The owner/operator shall fire the Gas Turbines (S-1, S-2, S-3, and S-4) exclusively on PUC-regulated natural gas with a maximum sulfur content of 1 grain per 100 standard cubic feet. To demonstrate compliance with this limit, the operator of S-1, S-2, S-3 and S-4 shall sample and analyze the gas from each supply source at least monthly to determine the sulfur content of the gas. PG&E monthly sulfur data may be used provided that such data can be demonstrated to be representative of the gas delivered to the MEP. (Basis: BACT for SO₂ and PM₁₀)
12. The owner/operator shall not operate the units such that the heat input rate to each Gas Turbine (S-1, S-2, S-3, and S-4) exceeds 481 MMBtu (HHV) per hour. (Basis: BACT)
13. The owner/operator shall not operate the units such that the heat input rate to each Gas Turbine (S-1, S-2, S-3, and S-4) exceeds 11,544 MMBtu (HHV) per day. (Basis: Cumulative Increase for PM₁₀)
14. The owner/operator shall not operate the units such that the combined cumulative heat input rate for the Gas Turbines (S-1, S-2, S-3, and S-4) exceeds 8,128,900 MMBtu (HHV) per year. (Basis: Offsets)
- 15a. The owner operator shall not operate any turbine S-1, S-2, S-3, or S-4 such that the hours of operation for any of the four units exceeds 4,225 hours per year (excluding operations necessary for maintenance, tuning, testing, startup and shutdown). (Basis: Offsets, Cumulative Increase)
16. The owner/operator shall ensure that each Gas Turbine (S-1, S-2, S-3, S-4) is abated by the properly operated and properly maintained Selective Catalytic Reduction (SCR)

System A-2, A-4, A-6 or A-8 and Oxidation Catalyst System A-1, A-3, A-5, or A-7 whenever fuel is combusted at those sources and the corresponding SCR catalyst bed (A-2, A-4, A-6 or A-8) has reached minimum operating temperature. (Basis: BACT for NO_x, POC and CO)

17. The owner/operator shall ensure that the Gas Turbines (S-1, S-2, S-3, S-4) comply with requirements (a) through (i). Requirements (a) through (f) do not apply during a gas turbine start-up, and shutdown. (Basis: BACT and Regulation 2, Rule 5)
 - a) Nitrogen oxide mass emissions (calculated as NO₂) at each exhaust point P-1, P-2, P-3, and P-4 (exhaust point for S-1, S-2, S-3 and S-4 Gas Turbine after abatement by A-2, A-4, A-6 and A-8 SCR System) shall not exceed 4.4 pounds per hour. (Basis: BACT for NO_x).
 - b) The nitrogen oxide emission concentration at each exhaust point P-1, P-2, P-3 and P-4 shall not exceed 2.5 ppmv, on a dry basis, corrected to 15% O₂, averaged over any 1-hour period. (Basis: BACT for NO_x)
 - c) Carbon monoxide mass emissions at each exhaust point P-1, P-2, P-3, and P-4 shall not exceed 2.14 pounds per hour. (Basis: BACT for CO)
 - d) The carbon monoxide emission concentration at each exhaust point P-1, P-2, P-3, and P-4 shall not exceed 2.0 ppmv, on a dry basis, corrected to 15% O₂ averaged over any rolling 3-hour period. (Basis: BACT for CO)
 - e) Ammonia (NH₃) emission concentrations at each exhaust point P-1, P-2, P-3, and P-4 shall not exceed 5 ppmv, on a dry basis, corrected to 15% O₂, averaged over any rolling 3-hour period. This ammonia emission concentration shall be verified by the continuous recording of the ammonia injection rate to each SCR System A-2, A-4, A-6, and A-8. The correlation between the gas turbine heat input rates, A-2, A-4, A-6, and A-8 SCR System ammonia injection rates, and corresponding ammonia emission concentration at emission points P-1, P-2, P-3 and P-4 shall be determined in accordance with Part 25 or a District approved alternative method. (Basis: Regulation 2, Rule 5)
 - f) Precursor organic compound (POC) mass emissions (as CH₄) at each exhaust point P-1, P-2, P-3, and P-4 shall not exceed 0.612 pounds per hour. (Basis: BACT for POC)
 - g) Sulfur dioxide (SO₂) mass emissions at each exhaust point P-1, P-2, P-3, and P-4 shall not exceed 1.347 pounds per hour. (Basis: BACT for SO₂)
 - h) Particulate matter with an aerodynamic diameter equal to or less than 10 microns (PM₁₀) mass emissions at each exhaust point P-1, P-2, P-3, and P-4 shall not exceed 2.5 pounds per hour. (Basis: BACT for PM₁₀)
 - i) Total particulate matter mass emissions at each exhaust point P-1, P-2, P-3, and P-4 shall not exceed 2.5 pounds per hour.
(Basis: Regulation 2, Rule 2, Section 419)
18. The owner/operator shall ensure that the regulated air pollutant mass emission rates from each of the Gas Turbines (S-1, S-2, S-3, and S-4) during a start-up or shutdown does not exceed the limits established below. Startups shall not exceed 30 minutes. Shutdowns shall not exceed 15 minutes. (Basis: BACT Limit for startup and shutdown operation)

TABLE 40. STARTUP AND SHUTDOWN			
Pollutant	Maximum Emissions Per Startup (lb/startup)	Maximum Emissions During Hour with Startup and/or Shutdown(lb/hr)	Maximum Emissions Per Shutdown (lb/shutdown)
NO _x (as NO ₂)	14.2	18.5	3.2
CO	14.1	18.1	2.9
POC (as CH ₄)	1.1	1.7	0.2

19. The owner/operator shall not allow total combined emissions from the Gas Turbines (S-1, S-2, S-3, and S-4), including emissions generated during gas turbine start-ups, and shutdowns to exceed the following limits during any calendar day:
- (a) 1129.7 pounds of NO_x (as NO₂) per day (Basis: Cumulative Increase)
 - (b) 1171.5 pounds of CO per day (Basis: Cumulative Increase)
 - (c) 120.82 pounds of POC (as CH₄) per day (Basis: Cumulative Increase)
 - (d) 241.44 pounds of PM₁₀ per day (Basis: Cumulative Increase)
 - (e) 178.26 pounds of SO₂ per day (Basis: Cumulative Increase)
20. The owner/operator shall not allow cumulative combined emissions from the Gas Turbines (S-1, S-2, S-3, and S-4), including emissions generated during gas turbine start-ups, shutdowns, and malfunctions to exceed the following limits during any consecutive twelve-month period:
- (a) 45.6 tons of NO_x (as NO₂) per year (Basis: Offsets)
 - (b) 29.98 tons of CO per year (Basis: Cumulative Increase)
 - (c) 5.90 tons of POC (as CH₄) per year (Basis: Cumulative Increase)
 - (d) 21.13 tons of PM₁₀ per year (Basis: Cumulative Increase)
 - (e) 2.87 tons of SO₂ per year (Basis: Cumulative Increase)
21. The owner/operator shall not allow the maximum projected annual toxic air contaminant emissions (per Part 26) from the Gas Turbines (S-1, S-2, S-3, S-4) combined to exceed the following limits:

formaldehyde	3725.26 pounds per year
benzene	107.94 pounds per year
Specified polycyclic aromatic hydrocarbons (PAHs)	1.063 pounds per year

unless the following requirement is satisfied:

The owner/operator shall perform a health risk assessment to determine the total facility risk using the emission rates determined by source testing and the most current Bay Area Air Quality Management District approved procedures and unit risk factors in effect at the time of the analysis. The owner/operator shall submit the risk analysis to the District and the CEC CPM within 60 days of the source test date. The owner/operator may

request that the District and the CEC CPM revise the carcinogenic compound emission limits specified above. If the owner/operator demonstrates to the satisfaction of the APCO that these revised emission limits will not result in a significant cancer risk, the District and the CEC CPM may, at their discretion, adjust the carcinogenic compound emission limits listed above. (Basis: Regulation 2, Rule 5)

22. The owner/operator shall demonstrate compliance with Parts 12 through 15, 17(a) through 17(e), 18 (NO_x and CO limits), 19(a), 19(b), 20(a) and 20(b) by using properly operated and maintained continuous monitors (during all hours of operation including gas turbine start-up, and shutdown periods). The owner/operator shall monitor for all of the following parameters:
- (a) Firing Hours and Fuel Flow Rates for each of the following sources: S-1, S-2, S-3, and S-4
 - (b) Oxygen (O₂) concentration, Nitrogen Oxides (NO_x) concentration, and carbon monoxide (CO) concentration at exhaust points P-1, P-2, P-3 and P-4.
 - (c) Ammonia injection rate at A-2, A-4, A-6 and A-8 SCR Systems

The owner/operator shall record all of the above parameters at least every 15 minutes (excluding normal calibration periods) and shall summarize all of the above parameters for each clock hour. For each calendar day, the owner/operator shall calculate and record the total firing hours, the average hourly fuel flow rates, and pollutant emission concentrations.

The owner/operator shall use the parameters measured above and District-approved calculation methods to calculate the following parameters:

- (d) Heat Input Rate for each of the following sources: S-1, S-2, S-3, and S-4
- (e) Corrected NO_x concentration, NO_x mass emission rate (as NO₂), corrected CO concentration, and CO mass emission rate at each of the following exhaust points: P-1, P-2, P-3 and P-4.

For each source and exhaust point, the owner/operator shall record the parameters specified in Parts 22(d) and 22(e) at least once every 15 minutes (excluding normal calibration periods). As specified below, the owner/operator shall calculate and record the following data:

- (f) total Heat Input Rate for every clock hour and the average hourly Heat Input Rate for every rolling 3-hour period.
- (g) on an hourly basis, the cumulative total Heat Input Rate for each calendar day for the following: each Gas Turbine and for S-1, S-2, S-3 and S-4 combined.
- (h) the average NO_x mass emission rate (as NO₂), CO mass emission rate, and corrected NO_x and CO emission concentrations for every clock hour.
- (i) on an hourly basis, the cumulative total NO_x mass emissions (as NO₂) and the cumulative total CO mass emissions, for each calendar day for the following: each Gas Turbine and for S-1, S-2, S-3 and S-4 combined.
- (j) For each calendar day, the average hourly Heat Input Rates, corrected NO_x emission concentration, NO_x mass emission rate (as NO₂), corrected CO emission concentration, and CO mass emission rate for each Gas Turbine.

- (k) on a monthly basis, the cumulative total NO_x mass emissions (as NO₂) and cumulative total CO mass emissions, for the previous consecutive twelve-month period for sources S-1, S-2, S-3, and S-4 combined. (Basis: 1-520.1, 9-9-501, BACT, Offsets, NSPS, Cumulative Increase)
23. To demonstrate compliance with Parts 17(f), 17(g), 17(h), 17(i), 19(c), 19(d), 19(e), 20(c), 20(d), 20(e), the owner/operator shall calculate and record on a daily basis, the precursor organic compound (POC) mass emissions, fine particulate matter (PM₁₀) mass emissions (including condensable particulate matter), and sulfur dioxide (SO₂) mass emissions from each power train. The owner/operator shall use the actual heat input rates measured pursuant to Part 22, actual Gas Turbine start-up times, actual Gas Turbine shutdown times, and CEC and District-approved emission factors developed pursuant to source testing under Part 26 to calculate these emissions. The owner/operator shall present the calculated emissions in the following format:
- (a) For each calendar day, POC, PM₁₀, and SO₂ emissions, summarized for each power train (Gas Turbine) and S-1, S-2, S-3, and S-4 combined
 - (b) on a monthly basis, the cumulative total POC, PM₁₀, and SO₂ mass emissions, for each year for S-1, S-2, S-3, and S-4 combined.
- (Basis: Offsets, Cumulative Increase)
24. To demonstrate compliance with Part 21, the owner/operator shall calculate and record on an annual basis the maximum projected annual emissions of: Formaldehyde, Benzene, and Specified PAH's. The owner/operator shall calculate the maximum projected annual emissions using the maximum annual heat input rate of 8,128,900 MMBtu/year for S-1, S-2, S-3, and S-4 combined and the highest emission factor (pounds of pollutant per MMBtu of heat input) determined by the most recent of any source test of the S-1, S-2, S-3, or S-4 Gas Turbines. If the highest emission factor for a given pollutant occurs during minimum-load turbine operation, a reduced annual heat input rate may be utilized to calculate the maximum projected annual emissions to reflect the reduced heat input rates during gas turbine start-up and minimum-load operation. The reduced annual heat input rate shall be subject to District review and approval. (Basis: Regulation 2, Rule 5)
25. Within 90 days of start-up of each of the MEP GE LM-6000 PC Sprint units, the owner/operator shall conduct a District-approved source test on exhaust point P-1, P-2, P-3, or P-4 to determine the corrected ammonia (NH₃) emission concentration to determine compliance with Part 17(e). The source test shall determine the correlation between the heat input rates of the gas turbine, A-2, A-4, A-6, or A-8 SCR System ammonia injection rate, and the corresponding NH₃ emission concentration at emission point P-1, P-2, P-3, or P-4. The source test shall be conducted over the expected operating range of the turbine (including, but not limited to, minimum and full load modes) to establish the range of ammonia injection rates necessary to achieve NO_x emission reductions while maintaining ammonia slip levels. The owner/operator shall repeat the source testing on an annual basis thereafter. Ongoing compliance with Part 17(e) shall be demonstrated through calculations of corrected ammonia concentrations based upon the source test correlation and continuous records of ammonia injection rate. The owner/operator shall

submit the source test results to the District and the CEC CPM within 60 days of conducting the tests. (Basis: Regulation 2, Rule 5)

26. Within 90 days of start-up of each of the MEP GE LM-6000 PC Sprint units and on an annual basis thereafter, the owner/operator shall conduct a District-approved source test on exhaust points P-1, P-2, P-3 and P-4 while each Gas Turbine is operating at maximum load to determine compliance with Parts 17(a), 17(b), 17(c), 17(d), 17(f), 17(g), 17(h), and 17(i) and while each Gas Turbine is operating at minimum load to determine compliance with Parts 17(c), and 17(d) and to verify the accuracy of the continuous emission monitors required in Part 22. The owner/operator shall test for (as a minimum): water content, stack gas flow rate, oxygen concentration, precursor organic compound concentration and mass emissions, nitrogen oxide concentration and mass emissions (as NO₂), carbon monoxide concentration and mass emissions, sulfur dioxide concentration and mass emissions, methane, ethane, and total particulate matter emissions including condensable particulate matter. The owner/operator shall submit the source test results to the District and the CEC CPM within 60 days of conducting the tests. (Basis: BACT, Offsets)

27. The owner/operator shall obtain approval for all source test procedures from the District's Source Test Section and the CEC CPM prior to conducting any tests. The owner/operator shall comply with all applicable testing requirements for continuous emission monitors as specified in Volume V of the District's Manual of Procedures. The owner/operator shall notify the District's Source Test Section and the CEC CPM in writing of the source test protocols and projected test dates at least 7 days prior to the testing date(s). As indicated above, the Owner/Operator shall measure the contribution of condensable PM (back half) to any measurement of the total particulate matter or PM₁₀ emissions. However, the Owner/Operator may propose alternative measuring techniques to measure condensable PM such as the use of a dilution tunnel or other appropriate method used to capture semi-volatile organic compounds. The owner/operator shall submit the source test results to the District and the CEC CPM within 60 days of conducting the tests. (Basis: BACT, Regulation 2, Rule 2, Section 419)

28. Within 90 days of start-up of each of the MEP GE LM-6000 PC Sprint gas turbines and on a biennial basis (once every two years) thereafter, the owner/operator shall conduct a District-approved source test on one of the following exhaust points P-1, P-2, P-3 or P-4 while the Gas Turbine is operating at maximum allowable operating rates to demonstrate compliance with Part 21. The owner/operator shall also test the gas turbine while it is operating at minimum load. If three consecutive biennial source tests demonstrate that the annual emission rates calculated pursuant to Part 24 for any of the compounds listed below are less than the BAAQMD trigger levels, pursuant to Regulation 2, Rule 5, shown, then the owner/operator may discontinue future testing for that pollutant:

Benzene	≤	3.8 pounds/year and 2.9 pounds/hour
Formaldehyde	<	18 pounds/year and 0.12 pounds/hour
Specified PAHs	≤	0.0069 pounds/year

(Basis: Regulation 2, Rule 5)

29. The owner/operator shall calculate the sulfuric acid mist (SAM) emission rate using the total heat input for the sources and the highest results of any source testing conducted pursuant to Part 30. If this SAM mass emission limit of Part 31 is exceeded, the owner/operator must utilize air dispersion modeling to determine the impact (in $\mu\text{g}/\text{m}^3$) of the sulfuric acid mist emissions pursuant to Regulation 2, Rule 2, Section 306. (Basis: Regulation 2, Rule 2, Section 306)
30. Within 90 days of start-up of each of the MEP GE LM-6000 PC Sprint gas turbines and on an annual basis thereafter, the owner/operator shall conduct a District-approved source test on two of the four exhaust points P-1, P-2, P-3 and P-4 while each gas turbine is operating at maximum heat input rates to demonstrate compliance with the SAM emission rates specified in Part 31. The owner/operator shall test for (as a minimum) SO_2 , SO_3 , and H_2SO_4 . The owner/operator shall submit the source test results to the District and the CEC CPM within 60 days of conducting the tests. (Basis: Regulation 2, Rule 2, Section 306, and Regulation 2, Rule 2, Section 419)
31. The owner/operator shall not allow sulfuric acid emissions (SAM) from stacks P-1, P-2, P-3, P-4 combined to exceed 7 tons in any consecutive 12 month period. (Basis: Regulation 2, Rule 2, Section 306, and Regulation 2, Rule 2, Section 419)
32. The owner/operator shall ensure that the stack height of emission points P-1, P-2, P-3 and P-4 is each at least 79.5 feet above grade level at the stack base. (Basis: Regulation 2, Rule 5)
33. The owner/operator of the MEP shall submit all reports to the District (including, but not limited to monthly CEM reports, monitor breakdown reports, emission excess reports, equipment breakdown reports, etc.) as required by District Rules or Regulations and in accordance with all procedures and time limits specified in the Rule, Regulation, Manual of Procedures, or Enforcement Division Policies & Procedures Manual. (Basis: Regulation 2, Rule 1, Section 403)
34. The owner/operator of the MEP shall maintain all records and reports on site for a minimum of 5 years. These records shall include but are not limited to: continuous monitoring records (firing hours, fuel flows, emission rates, monitor excesses, breakdowns, etc.), source test and analytical records, natural gas sulfur content analysis results, emission calculation records, records of plant upsets and related incidents. The owner/operator shall make all records and reports available to District and the CEC CPM staff upon request. (Basis: Regulation 2, Rule 1, Section 403, Regulation 2, Rule 6, Section 501)
35. The owner/operator of the MEP shall notify the District and the CEC CPM of any violations of these permit conditions. Notification shall be submitted in a timely manner, in accordance with all applicable District Rules, Regulations, and the Manual of Procedures. Notwithstanding the notification and reporting requirements given in any District Rule, Regulation, or the Manual of Procedures, the owner/operator shall submit

written notification (facsimile is acceptable) to the Enforcement Division within 96 hours of the violation of any permit condition. (Basis: Regulation 2, Rule 1, Section 403)

36. The Owner/Operator of MEP shall provide adequate stack sampling ports and platforms to enable the performance of source testing. The location and configuration of the stack sampling ports shall comply with the District Manual of Procedures, Volume IV, Source Test Policy and Procedures, and shall be subject to BAAQMD review and approval, except that the facility shall provide four sampling ports that are at least 6 inches in diameter in the same plane of each gas turbine stack (P-1, P-2, P-3, P-4). (Basis: Regulation 1, Section 501)
37. Within 180 days of the issuance of the Authority to Construct for the MEP, the Owner/Operator shall contact the BAAQMD Technical Services Division regarding requirements for the continuous emission monitors, sampling ports, platforms, and source tests required by Parts 10, 25, 26, 28 and 30. The owner/operator shall conduct all source testing and monitoring in accordance with the District approved procedures. (Basis: Regulation 1, Section 501)
38. The owner/operator shall ensure that the MEP complies with the requirement to hold SO₂ allowances in 40 CFR 72.9(c)(1) and the continuous emission monitoring requirements of 40 CFR Part 75. (Basis: Regulation 2, Rule 7)

Condition 22850

For S-5, Diesel Fire Pump

1. The owner/operator shall not exceed 50 hours per year per engine for reliability-related testing. [Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(3) or (e)(2)(B)(3)]
2. The owner/operator shall operate each emergency standby engine only for the following purposes: to mitigate emergency conditions, for emission testing to demonstrate compliance with a District, State or Federal emission limit, or for reliability-related activities (maintenance and other testing, but excluding emission testing). Operating while mitigating emergency conditions or while emission testing to show compliance with District, State or Federal emission limits is not limited. [Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(3) or (e)(2)(B)(3)]
3. The owner/operator shall operate each emergency standby engine only when a non-resettable totalizing meter (with a minimum display capability of 9,999 hours) that measures the hours of operation for the engine is installed, operated and properly maintained. [Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(4)(G)(1)]
4. Records: The owner/operator shall maintain the following monthly records in a District-approved log for at least 36 months from the date of entry (60 months if the facility has

been issued a Title V Major Facility Review Permit or a Synthetic Minor Operating Permit). Log entries shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request.

- a. Hours of operation for reliability-related activities (maintenance and testing).
- b. Hours of operation for emission testing to show compliance with emission limits.
- c. Hours of operation (emergency).
- d. For each emergency, the nature of the emergency condition.
- e. Fuel usage for each engine(s).

[Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(4)(I), (or, Regulation 2-6-501)]

5. At School and Near-School Operation:

If the emergency standby engine is located on school grounds or within 500 feet of any school grounds, the following requirements shall apply:

The owner/operator shall not operate each stationary emergency standby diesel-fueled engine for non-emergency use, including maintenance and testing, during the following periods:

- a. Whenever there is a school-sponsored activity (if the engine is located on school grounds)
- b. Between 7:30 a.m. and 3:30 p.m. on days when school is in session.

"School" or "School Grounds" means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in a private home(s). "School" or "School Grounds" includes any building or structure, athletic field, or other areas of school property but does not include unimproved school property.

[Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(1)] or (e)(2)(B)(2)]

10 Preliminary Determination

The APCO has made a preliminary determination that the proposed Mariposa Energy Project, which is composed of the sources listed below, complies with all applicable District, state and federal air quality rules and regulations. The following sources will be subject to the permit conditions and BACT and offset requirements discussed previously.

- S-1 Combustion Turbine Generator (CTG) #1, GE LM 6000 PC-Sprint, Natural Gas Fired, 48.5 MW, 481 MMBtu/hr maximum rated capacity (HHV); abated by A-1 Oxidation Catalyst and A-2 Selective Catalytic Reduction System (SCR).
- S-2 Combustion Turbine Generator (CTG) #2, GE LM 6000 PC-Sprint, Natural Gas Fired, 48.5 MW, 481 MMBtu/hr maximum rated capacity (HHV); abated by A-3 Oxidation Catalyst and A-4 Selective Catalytic Reduction System (SCR).
- S-3 Combustion Turbine Generator (CTG) #3, GE LM 6000 PC-Sprint, Natural Gas Fired, 48.5 MW, 481 MMBtu/hr maximum rated capacity (HHV); abated by A-5 Oxidation Catalyst and A-6 Selective Catalytic Reduction System (SCR).
- S-4 Combustion Turbine Generator (CTG) #4, GE LM 6000 PC-Sprint, Natural Gas Fired, 48.5 MW, 481 MMBtu/hr maximum rated capacity (HHV); abated by A-7 Oxidation Catalyst and A-8 Selective Catalytic Reduction System (SCR).
- S-5 Diesel Fire Pump: Make: Cummins; Model: CFP7E-F40; Model Year: TBD (2009 or later); Rated bhp: 220

This document is subject to the public notice, public comment, and public inspection requirements of District Regulations 2-2-405 and 2-2-406. Accordingly, a notice inviting written public comment will be published in a newspaper of general circulation in the area of the proposed Mariposa Energy Project and mailed to certain entities. The public inspection and comment period will be at least 30 days in duration and will start the date of such publication. Written comments on this document should be directed to:

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Bay Area Air Quality Management District
939 Ellis Street
San Francisco CA 94109
bcabral@baaqmd.gov

11. Glossary of Acronyms

AAQS	Ambient Air Quality Standard
ARB	Air Resource Board
BTU	British Thermal Unit
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
Cal ISO	California Independent System Operator
CAISO	California Independent System Operator
CARB	California Air Resources Board
CEC	California Energy Commission
CEM	Continuous Emission Monitor
CEQA	California Environmental Quality Act
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CPUC	California Public Utilities Commission
CTG	Combustion Turbine Generator
EO/APCO	Executive Officer/Air Pollution Control Officer
EPA	Environmental Protection Agency
ERC	Emission Reduction Credit
FDOC	Final Determination of Compliance
GE	General Electric Company
GHG	Greenhouse Gases
GT	Gas Turbine
MW	Megawatt
NH ₃	Ammonia
N ₂	Nitrogen
NO	Nitric Oxide
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
NSR	New Source Review
O ₂	Oxygen
LAER	Lowest Achievable Emissions Rate
LLC	Limited Liability Company
MEP	Mariposa Energy Project
MMBtu	Million Btu
NAAQS	National Ambient Air Quality Standard
PAH	Polycyclic Aromatic Hydrocarbon
PDOC	Preliminary Determination of Compliance
PG&E	Pacific Gas & Electric Company
PM ₁₀	Particulate Matter less than 10 Microns in Diameter
PM _{2.5}	Particulate Matter less than 2.5 Microns in Diameter
POC	Precursor Organic Compounds
ppmvd	Parts Per Million by Volume, Dry
PSD	Prevention of Significant Deterioration

PUC	Public Utilities Commission
RACT	Reasonably Available Control Technology
RATA	Relative Accuracy Test Audit
SCAQMD	South Coast Air Quality Management District
SNCR	Selective Non-catalytic Reduction
SCR	Selective Catalytic Reduction
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO ₂	Sulfur Dioxide
SO _x	Sulfur Oxides
TAC	Toxic Air Contaminant
TBACT	Toxics Best Available Control Technology
U.S. EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

Appendix A

Emission Calculations

Mariposa Energy Project
Emissions Standards

Emission Calculation Standards:

The following physical constants and standard conditions were utilized to derive the criteria-pollutant emission factors used to estimate and verify criteria pollutant and toxic air contaminant emissions submitted with the permit application. The criteria emission calculations were prepared by the applicant's consultant and are based on a combustion model. The District has verified these values using the calculations shown below. For the toxic air contaminants the District revised the calculation submitted by the applicant.

standard temperature:	68°F
standard pressure:	14.7 psia
molar volume:	385.54 dscf/lbmol
ambient oxygen concentration:	20.95%
dry flue gas factor ^b :	8710 dscf/MM Btu
natural gas higher heating value:	1020 Btu/dscf

^b F-factor is based upon the assumption of complete stoichiometric combustion of natural gas. In effect, it is assumed that all excess air present before combustion is emitted in the exhaust gas stream. Value shown is the standard value given by EPA in Method 19, Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates.

Table A-1 summarizes the regulated air pollutant emission factors that were used to calculate mass emission rates for each source. All units are pounds per million Btu of natural gas fired based upon the high heating value (HHV). All emission factors are after abatement by applicable control equipment.

**Mariposa Energy Project
Turbine Criteria Pollutant Emission Estimates**

Pollutant	lb/MM Btu	One Simple-Cycle Turbine Emission Rate (lbs/hr)
NO _x (as NO ₂) ^a	0.00915	4.40
CO ^b	0.004456	2.14
POC (as CH ₄)	0.00127	0.612
PM ₁₀ /PM _{2.5}	0.0052	2.5
SO _x (as SO ₂) Maximum ^d	0.0028	1.35
SO _x (as SO ₂) Annual Average ^c	0.0007	0.34

^a Based upon stack concentration of 2.5 ppmvd NO_x @ 15% O₂ that reflects the use of dry low-NO_x combustors at the CTG and abatement by the Selective Catalytic Reduction Systems with ammonia injection.

^b Based upon the permit condition emission limit of 2 ppmvd CO @ 15% O₂ that reflects abatement by oxidation catalysts.

^c Average SO_x emissions based on 0.25 grains sulfur per 100 scf of natural gas and an average annual firing rate of 481 MMBtu/hour.

^d Maximum SO_x emissions based on 1 grain sulfur per 100 scf of natural gas.

REGULATED AIR POLLUTANTS

NITROGEN OXIDE EMISSIONS

The combined NO_x emissions from the simple-cycle gas turbines will be 2.5 ppmv, dry @ 15% O₂. This concentration is converted to a mass emission factor as follows:

$$(2.5 \text{ ppmv})(20.95 - 0)/(20.95 - 15) = 8.80 \text{ ppmv of NO}_x, \text{ dry @ 0\% O}_2$$

$$(8.80 \text{ E-}6)(1 \text{ lbmol}/385.54 \text{ dscf})(46 \text{ lb of NO}_2/\text{lbmol})(8710 \text{ dscf/MM Btu})$$

$$= 0.00915 \text{ lb of NO}_2/\text{MM Btu}$$

$$(0.00915 \text{ lb of NO}_2/\text{MM Btu}) (481 \text{ MMBtu/hr}) = 4.40 \text{ lb of NO}_x \text{ (as NO}_2\text{)}/\text{hr}$$

CARBON MONOXIDE EMISSIONS

The CO emissions from the simple-cycle gas turbines will be conditioned to a maximum controlled CO emission limit of 2 ppmv, dry @ 15% O₂ during all operating modes except gas turbine start-up, shutdown and combustor tuning. The emission factor corresponding to this emission concentration is calculated as follows:

$$(2 \text{ ppmv})(20.95 - 0)/(20.95 - 15) = 7.04 \text{ ppmv, dry @ 0\% O}_2$$

$$(7.04 \text{ E-6})(1 \text{ lbmol}/385.54 \text{ dscf})(28 \text{ lb of NO}_2/\text{lbmol})(8710 \text{ dscf/MM Btu})$$

$$= 0.00445 \text{ lb of CO/MM Btu}$$

$$(0.00445 \text{ lb of NO}_2/\text{MM Btu}) (481 \text{ MMBtu/hr}) = 2.14 \text{ lb of CO/hr}$$

PRECURSOR ORGANIC COMPOUND (POC) EMISSIONS

The POC emissions from the simple-cycle gas turbines will be conditioned to a maximum controlled emission limit of 1 ppmv, dry @ 15% O₂ during all operating modes except gas turbine start-up and shutdown. The POC emission factor corresponding to this emission concentration is calculated as follows:

$$(1 \text{ ppmv})(20.95 - 0)/(20.95 - 15) = 3.52 \text{ ppmv, dry @ 0\% O}_2$$

$$(3.52 \text{ E-6})(1 \text{ lbmol}/385.54 \text{ dscf})(16 \text{ lb CH}_4/\text{lbmol})(8710 \text{ dscf/MM Btu})$$

$$= 0.00127 \text{ lb of POC/MM Btu}$$

$$(0.00127 \text{ lb of POC/MM Btu}) (481 \text{ MMBtu/hr}) = 0.612 \text{ lb of VOC/hr}$$

The amount of fuel that the turbine can burn varies with the ambient temperature. The emissions are conservatively calculated as if the ambient temperature is 46°F, because at that temperature, the turbines can burn the maximum amount of fuel. The daily emissions are based on maximum daily operation of 24 hours/day. The annual emissions are based on maximum annual operation for 4000 hours/year. These are the steady-state controlled emissions. Emissions equivalent to 150 hours in startup mode and 75 hours in shutdown mode will be added to the annual emission limits.

NO_x = 2.5 ppm @ 15% O₂ for 1-hour							
Normal Operating Scenario			NO _x Emissions (Per Turbine)				For all 4 turbines
Ambient Temp F	Load %	Fuel Input Per CT MMBtu/hr (HHV)	lb/hr	lb/day	lb/yr	tons/yr	tons/yr
17	100	465					
46	100	481	4.4	105.6	17,600	8.8	35.2
59	100	465					
59	50	282					
93	100	391					
93	50	270					
112	100	338					

CO = 2.0 ppm @ 15% O₂ for 3-hour rolling							
Normal Operating Scenario			CO Emissions (Per Turbine)				For all 4 turbines
Ambient Temp F	Load %	Fuel Input Per CT MMBtu/hr (HHV)	lb/hr	lb/day	lb/yr	tons/yr	tons/yr
17	100	465					
46	100	481	2.14	51.36	8,560	4.28	17.12
59	100	465					
59	50	282					
93	100	391					
93	50	270					
112	100	338					

Turbine Criteria Pollutant Emission Estimates

VOC = 1.0 ppm @ 15% O ₂ for 1-hour							
Normal Operating Scenario			VOC Emissions (Per Turbine)				For all 4 turbines
Ambient Temp F	Load %	Fuel Input Per CT MMBtu/hr (HHV)	lb/hr	lb/day	lb/yr	tons/yr	tons/yr
17	100	465	0.612	14.688	2,448	1.224	4.896
46	100	481					
59	100	465					
59	50	282					
93	100	391					
93	50	270					
112	100	338					

PARTICULATE MATTER (PM₁₀) EMISSIONS

The District has determined a PM₁₀ emission rate of 2.5 lb/hour corresponds to BACT for the simple-cycle gas turbines. This emission rate corresponds to 0.0052 lb per MMBtu.

SULFUR DIOXIDE EMISSIONS

The SO₂ emission factor is based upon annual average natural gas sulfur content of 0.25 grains per 100 scf and a higher heating value of 1020 Btu/scf.

The sulfur emission factor is calculated as follows:

Natural Gas: 1 grain of S/100 scf maximum

$$\begin{aligned}\text{SO}_2 &= (1 \text{ gr}/100 \text{ scf})(\text{lb}/7000 \text{ gr})(1/1020 \text{ BTU}/\text{scf})(1 \times 10^6 \text{ Btu/MMBtu})(64 \text{ lb SO}_2/32 \text{ lb S}) \\ &= 0.002801 \text{ lb/MMBtu}\end{aligned}$$

Natural Gas: 0.25 grain of S/100 scf for Annual Average

$$\begin{aligned}\text{SO}_2 &= (0.25 \text{ gr}/100 \text{ scf})(\text{lb}/7000 \text{ gr})(1/1020 \text{ BTU}/\text{scf})(1 \times 10^6 \text{ Btu/MMBtu})(64 \text{ lb SO}_2/32 \text{ lb S}) \\ &= 0.0007 \text{ lb/MMBtu}\end{aligned}$$

Maximum Hourly SO₂

The corresponding SO₂ emission rate for one gas turbine:

$$\begin{aligned}0.0028 \text{ lb SO}_2/\text{MM Btu})(481 \text{ MM Btu/hr}) &= 1.347 \text{ lb/hr} \\ &= 1.35 \text{ lb/hr}\end{aligned}$$

Annual Average SO₂

The corresponding SO₂ emission rate for one gas turbine:

$$\begin{aligned}(0.0007 \text{ lb SO}_2/\text{MM Btu})(481 \text{ MM Btu/hr}) &= 0.337 \text{ lb/hr} \\ &= 0.34 \text{ lb/hr}\end{aligned}$$

**Mariposa Energy Project
Startup and Shutdown Emission Estimates**

Mode	Value	Units	Notes
Total Start Up Duration	30	minutes	Based on client data from existing LM6000 plant.
Total Shutdown Duration	15	minutes	Based on client data from existing LM6000 plant.
SCR/Ox Cat Start Up Duration	20	minutes	SCR/Ox Cat warm up period after turbine start of 10 minutes.
SCR/Ox Cat Shutdown Duration	7		Additional SCR/Ox cat shutdown period in addition to the 8 minutes GE shutdown curve.
Starts/Shutdowns/Day	12	each	
Starts/CTG/Year	300	each	
Shutdown/CTG/Year	300	each	

Emission Rate (pound per period)

Initial Startup/Shutdown	NOx	CO	VOC	Reference
Startup Emission Data	3.5	3.0	0.058	Initial 10 minutes - GE LM6000 Start Curve at ISO Conditions
Shutdown Emission Data	2.7	2.4	0.047	Final 8 minutes - GE LM6000 Shutdown Curve at ISO Conditions

Maximum Hourly Emission Rate (Steady State)

Mode	NOx (lb/hr)	CO (lb/hr)	VOC (lb/hr)	NOx (lb/min)	CO (lb/min)	VOC (lb/min)
without SCR/Ox Cat control	43.950	66.800	6.370	0.733	1.113	0.106
with SCR/Ox Cat control	4.395	6.430	1.191	0.073	0.107	0.020

Startup/Shutdown Emission Estimates Per CTG							
Pollutant	Start-up lb/Events	Shutdown lb/Events	Highest hour lb/hour	For 12 Startup Emissions lb/day	For 12 Shutdown Emissions lb/day	For 300 Startup Emissions lb/year	For 300 Shutdown Emissions lb/year
NOx	14.2	3.2	18.5	222	38.4	4260	960
CO	14.1	2.9	18.1	217	34.8	4,230	870
POC	1.1	0.2	1.7	13.2	2.4	330	60
PM10	1.25	0.625	2.50	15	7.5	375	187.5
SO2 ^a	0.17/0.675 ^a	0.085/0.338 ^a	1.35	2.04/8.1 ^a	1.0/4.1 ^a	51.0 ^a	25.5 ^a

^aLower SO2 values assume average sulfur content in fuel. Higher SO2 values assume maximum sulfur in fuel. The maximum sulfur content has been used for daily calculations and limits. The average sulfur content has been used for annual calculations and limits.

Startup/Shutdown Emission Estimates for 4 CTG								
Pollutant	Highest hour lb/hour	Startup lb/day	Shutdown lb/day	Startup lb/year	Shutdown lb/year	Startup TPY	Shutdown TPY	Combine Start/Stop TPY
NOx	74	888	153.6	17,040	3,840	8.52	1.92	10.44
CO	72.4	868	139.2	16,920	3,480	8.46	1.74	10.2
POC	6.8	52.8	9.6	1,320	240	0.66	0.12	0.78
PM10	10	60	30	1500	750	0.75	0.38	1.13
SO2	5.4	32.4 ^a	16.4 ^a	204 ^a	102 ^a	0.10 ^a	0.05 ^a	0.15 ^a

^aLower SO2 values assume average sulfur content in fuel. Higher SO2 values assume maximum sulfur in fuel. The maximum sulfur content has been used for daily calculations and limits. The average sulfur content has been used for annual calculations and limits.

**Mariposa Energy Project
Startup and Shutdown Emission Estimates**

The startup and shutdown emissions have been estimated using a combination of manufacturer's data and the District's BACT determination, which is presented on an hourly and minute basis below.

Steady state one-hour emissions without SCR/Oxidation catalyst control (Data provided by manufacturer)

NOx	43.950 lb/hr	0.733 lb/min
CO	66.800 lb/hr	1.113 lb/min
VOC	6.370 lb/hr	0.106 lb/min

Steady state one-hour emissions with SCR/Oxidation Catalyst control (Based on BACT determination)

NOx	4.395 lb/hr	0.073 lb/min
CO	2.14 lb/hr	0.036 lb/min
VOC	0.612 lb/hr	0.010 lb/min

Initial period startup emissions from turbine for first 10 minutes (Data provided by manufacturer)

NOx	3.5 lb/period for first 10 minutes
CO	3.0 lb/period for first 10 minutes
VOC	0.058 lb/period for first 10 minutes

Shutdown emissions from turbine for final 8 minutes (Data provided by manufacturer)

NOx	2.7 lb/period for final 8 minutes
CO	2.4 lb/period for final 8 minutes
VOC	0.047 lb/period for final 8 minutes

The maximum emissions in lb/event for each pollutant for a startup event lasting 30 minutes have been calculated as shown below. In some cases, the applicant has proposed lower emissions because there is some degree of control during the “uncontrolled” periods. The manufacturer has provided the emissions during the initial 10-minute period. During this period, the turbines ramp up to the maximum firing rate. After the initial 10 minutes, the turbines are considered to be uncontrolled for up to 14 minutes. During this time, the catalyst heats up. The ammonia injection systems are started when the SCR catalyst is at the proper temperature. After the ammonia injection starts, there will be some lag time before the NOx CEM measures reduced NOx emissions. After the 14 minutes of uncontrolled operation, the turbines are considered to be controlled.

lb/event = Emissions in pounds during initial 10-minute period + 14 minutes uncontrolled emissions + 6 minutes controlled emissions

For NO_x:

lb/event = 3.5 lbs during initial 10-minute period + 14 min uncontrolled NO_x emission rate + 6 min controlled NO_x emission rate

lb/event = 3.5 lb/initial 10 minutes + (14 min x 0.733 lb/min uncontrolled) + (6 min x 0.073 lb/min controlled)

lb/event = 14.2 lb/30 min event

For CO:

lb/event = 3.0 lbs during initial 10-minute period + 14 minutes uncontrolled CO emission rate + 6 minutes controlled CO emission rate

lb/event = 3.0 lb/initial 10 minutes + (14 minutes x 1.113 lb/min uncontrolled) + (6 minutes x 0.036 lb/min controlled)

lb/event = 18.79 lb/30 min event

Proposed emissions: 14.1 lb per 30 min event

For POC:

lb/event = 0.058 lbs during initial 10-minute period + 14 minutes uncontrolled CO emission rate + 6 minutes controlled CO emission rate

lb/event = 0.058 lb/initial 10 minutes + (14 minutes x 0.106 lb/min uncontrolled) + (6 minutes x 0.010 lb/min controlled)

lb/event = 1.60 lb/30 min event

Proposed emissions: 1.1 lb per 30 min event

SO₂ and PM₁₀ are calculated by assuming that the hourly rate is unchanged from the steady state, so the emissions of SO₂ and PM₁₀ during a half-hour startup are assumed to be 0.17 and 1.25 lb/hr, respectively.

The emissions in lb/event for each pollutant for a shutdown event lasting 15 minutes are calculated as follows:

The manufacturer has provided the emissions during the final 8 minutes of shutdown. During the beginning of the 15-minute shutdown period, the turbines are considered to be controlled.

lb/event = 7 minutes controlled emissions + emissions in pounds during final 8 minutes

For NO_x:

lb/event = (7 min x 0.073 lb/min controlled) + 2.7 lb during final 8 minutes = 3.21 lb/15 minute event

For CO:

lb/event = (7 min x 0.036 lb/min controlled) + 2.4 lb during final 8 minutes = 2.65 lb/15 minute event

Proposed emissions: 2.9 lb per 15-minute event

For POC:

lb/event = (7 min x 0.010 lb/min controlled) + 0.047 lb during final 8 minutes = 0.117 lb/15 minute event

Proposed emissions: 0.2 lb per 15-minute event

Following is a calculation of the maximum hourly emissions assuming that the hour has one startup and one shutdown.

Hour containing one startup and one shutdown:

It takes 30 minutes to start up the turbine. The emissions for an hour that includes a 30-minute startup, 15 minutes of steady state operation, and a 15-minute shutdown would be:

NOx: 14.2 lb in 30 minutes + (15 min x 0.073 lb/min) + 3.2 lb in 15 minutes = 18.49 lb NOx/hr

CO: 14.1 lb in 30 minutes + (15 min x 0.071 lb/min) + 2.9 lb in 15 minutes = 18.1 lb CO/hr

POC: 1.1 lb in 30 minutes + (15 min x 0.020 lb/min) + 0.2 lb in 15 minutes = 1.6 lb POC/hr

The applicant has proposed the following maximum hourly emissions:

NOx: 18.5 lb/hr

CO: 18.1 lb/hr

POC: 1.7 lb/hr

It is assumed that the emissions of PM10 and SO2 do not change during startup.

Mariposa Energy Project
Grain Loading calculation

Grain Loading Calculation for GE LM-6000 PC Sprint Simple Cycle Gas Turbines

PM-10/PM2.5 Maximum Emission Rate 2.5 lb/hr

Firing Rate 481 MMBtu/hr

F-factor 8743 dscf/MMBtu

lb = 7000 grains

Corrected O2 Concentration 15% for gas turbine

Ambient Air O2 Concentration 20.9%

At 15% O2

$\text{grains/dscf} = (2.5 \text{ lb/hr} \times 7000 \text{ grains/lb}) / (481 \text{ MMBtu/hr} \times (8743 \text{ dscf/MMBtu} \times 20.9 / (20.9 - 15)))$

$\text{grains/dscf} = 0.0012$

**Mariposa Energy Project
Commissioning Emissions**

Expected Commissioning Phase and Emissions for a Single GE LM 6000 Turbine								
Phase (Each Turbine)	Hours/Day Operation	Days operation	Load Range	NOx lbs/hr	NOx lbs/day	NOx for 4 turbines lbs/year	NOx in tons per Turbine	NOx in tons for 4 Turbines
Initial Load Testing and Engine Checkout	<=4	<=2	<=10%	51	204	1632	0.204	0.816
Pre-Catalyst Initial Tuning	<=8	<=9	50-100%	51	408	14688	1.836	7.344
Post-Catalyst Initial Tuning	<=8	<=15	50-100%	34	272	16320	2.04	8.16
Total Emissions					884	32640	4.08	16.32

Expected Commissioning Phase and Emissions for a Single GE LM 6000 Turbine								
Phase (Each Turbine)	Hours/Day Operation	Days operation	Load Range	CO lbs/hr	CO lbs/day	CO for 4 turbines lbs/year	CO in tons per Turbine	CO in tons for 4 Turbines
Initial Load Testing and Engine Checkout	<=4	<=2	<=10%	45	180	1440	0.18	0.72
Pre-Catalyst Initial Tuning	<=8	<=9	50-100%	45	360	12960	1.62	6.48
Post-Catalyst Initial Tuning	<=8	<=15	50-100%	6.2	49.6	2976	0.372	1.48
Total Emissions					589.6	17376	2.172	8.68

Expected Commissioning Phase and Emissions for a Single GE LM 6000 Turbine								
Phase (Each Turbine)	Hours/Day Operation	Days operation	Load Range	VOC lbs/hr	VOC lbs/day	VOC for 4 turbines lbs/year	VOC in tons per Turbine	VOC in tons for 4 Turbine
Initial Load Testing and Engine Checkout	<=4	<=2	<=10%	4.48	17.92	143.36	0.01792	0.07168
Pre-Catalyst Initial Tuning	<=8	<=9	50-100%	4.48	35.84	1290.24	0.1613	0.06452
Post-Catalyst Initial Tuning	<=8	<=15	50-100%	1.2	9.6	576	0.072	0.288
Total Emissions					63.36	2009.6	0.25122	1

Commissioning Emissions

Expected Commissioning Phase and Emissions for a Single GE LM 6000 Turbine								
Phase (Each Turbine)	Hours/Day Operation	Days operation	Load Range	PM10 lbs/hr	PM10 lbs/day	PM10 for 4 turbines lbs/year	PM10 in tons per Turbine	PM10 in tons for 4-Turbine
Initial Load Testing and Engine Checkout	<=4	<=2	<=10%	2.5	10	80	0.01	0.04
Pre-Catalyst Initial Tuning	<=8	<=9	50-100%	2.5	20	720	0.09	0.36
Post-Catalyst Initial Tuning	<=8	<=15	50-100%	2.5	20	1200	0.15	0.6
Total Emissions					50	2000	0.25	1

Expected Commissioning Phase and Emissions for a Single GE LM 6000 Turbine								
Phase (Each Turbine)	Hours/Day Operation	Days operation	Load Range	SOx lbs/hr	SOx lbs/day	SOx for 4 turbines lbs/year	SOx in tons per Turbine	SOx in tons for 4-Turbine
Initial Load Testing and Engine Checkout	<=4	<=2	<=10%	0.91	3.64	29.12	0.00364	0.01456
Pre-Catalyst Initial Tuning	<=8	<=9	50-100%	0.91	7.28	262.08	0.03276	0.13104
Post-Catalyst Initial Tuning	<=8	<=15	50-100%	0.91	7.28	436.8	0.0546	0.2184
Total Emissions					18.2	728	0.091	0.364

Mariposa Energy Project Toxic Air Contaminant Emissions

MAXIMUM FACILITY TOXIC AIR CONTAMINANT (TAC) EMISSIONS							
	EF	Per Turbine	Per Turbine	Total for 4 Turbines	Total for 4 Turbines	Acute Risk Screening Trigger Level	Chronic Risk Screening Trigger Level
Toxic Air Contaminant	lb/MMBtu	lb/hour	lb/year	lb/hour	lb/year	(lb/hr)	(lb/yr)
1,3-Butadiene	0.00000012	0.000060	0.258	0.00024	1.0307	None	0.63
Acetaldehyde	0.00013431	0.064645	277.974	0.25858	1111.8974	1	38
Acrolein	0.00001853	0.008918	38.348	0.03567	153.3931	0.0055	14
Ammonia	0.00680000	3.272840	14073.212	13.09136	56292.8480	7.1	7700
Benzene	0.00001304	0.006276	26.986	0.02510	107.9433	2.9	3.8
Benzo(a)anthracene	0.00000002	0.000011	0.046	0.00004	0.1834	None	None
Benzo(a)pyrene	0.00000001	0.000007	0.028	0.00003	0.1128	None	0.0069
Benzo(b)fluoranthene	0.00000001	0.000005	0.023	0.00002	0.0917	None	None
Benzo(k)fluoranthene	0.00000001	0.000005	0.022	0.00002	0.0893	None	None
Chrysene	0.00000002	0.000012	0.051	0.00005	0.2045	None	None
Dibenz(a,h)anthracene	0.00000002	0.000011	0.048	0.00004	0.1907	None	None
Ethylbenzene	0.00001755	0.008446	36.319	0.03379	145.2771	None	43
Formaldehyde	0.00045000	0.216585	931.316	0.86634	3725.2620	0.21	18
Hexane	0.00025392	0.122212	525.514	0.48885	2102.0542	None	270000
Indeno(1,2,3-cd)pyrene	0.00000002	0.000011	0.048	0.00004	0.1907	None	None
Naphthalene	0.00000163	0.000783	3.368	0.00313	13.4726	None	None
Propylene	0.00075588	0.363806	1564.367	1.45522	6257.4662	None	120000
Propylene Oxide	0.00004686	0.022555	96.987	0.09022	387.9467	6.8	29
Toluene	0.00006961	0.033502	144.060	0.13401	576.2388	82	12000
Xylene (Total)	0.00002559	0.012316	52.957	0.04926	211.8286	49	27000
Sulfuric Acid Mist (H2SO4)	0.00058950	0.283550	1197.997	1.1342	4791.9866	0.26	39
Benzo(a)pyrene equivalents	0.0000000448	0.000022	0.093	0.00009	0.3706	None	0.0069
PAH	0.001132	1.0640	-----	-----	-----	-----	-----
One (1)-Diesel Engine (0.127 g/bhp/hr)		(220 bhp)		(50 hrs/yr)	(3.07 lb/yr)	None	0.63

Notes: PAH impacts are evaluated as Benzo(a)pyrene equivalents.

Equivalency
Factor

Benzo(a)anthracene	0.1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.1
Chrysene	0.01
Dibenz(a,h)anthracene	1.05
Indeno(1,2,3-cd)pyrene	0.1

Mariposa Energy Project Ammonia Emissions

Ammonia Emission Factors

The limit for ammonia concentration will be 5 ppm @ 15% O₂. This concentration is converted to a mass emission factor as follows:

$$(5 \text{ ppmv})(20.95 - 0)/(20.95 - 15) = 17.6 \text{ ppmv of NH}_3, \text{ dry @ 0\% O}_2$$

$$(17.6 \text{ E-6})(1 \text{ lbmol}/385.54 \text{ dscf})(17 \text{ lb of NH}_3/\text{lbmol})(8710 \text{ dscf/MM Btu})$$

$$= 0.00675 \text{ lb of NH}_3/\text{MM Btu}$$

$$(0.0068 \text{ lb of NH}_3/\text{MM Btu}) (481 \text{ MMBtu/hr}) = 3.27 \text{ lb of NO}_x \text{ (as NO}_2\text{)}/\text{hr}$$

Mariposa Energy Project
Toxic Air Contaminant Emissions

CATEF Gas Turbine TAC Emission Factors												
ID	System Type	Material Type	SCC	APC Device	Other Desc	CAS	Substance	Max Emission factor	Mean	Median	Unit	lb/MMBtu
4543	Turbine	Natural gas	20200203	COC/SCR	None	106-99-0	1,3-Butadiene	1.33E-04	1.27E-04	1.24E-04	lbs/MMcf	1.25E-07
4568	Turbine	Natural gas	20200203	COC/SCR	None	75-07-0	Acetaldehyde	5.11E-01	1.37E-01	5.38E-02	lbs/MMcf	1.34E-04
4573	Turbine	Natural gas	20200203	COC/SCR	None	107-02-8	Acrolein	6.93E-02	1.89E-02	1.09E-02	lbs/MMcf	1.85E-05
4584	Turbine	Natural gas	20200203	COC/SCR	None	71-43-2	Benzene	4.72E-02	1.33E-02	1.01E-02	lbs/MMcf	1.30E-05
4593	Turbine	Natural gas	20200203	COC/SCR	None	56-55-6	Benzo(a)anthracene	1.34E-04	2.26E-05	3.61E-06	lbs/MMcf	2.22E-08
4598	Turbine	Natural gas	20200203	COC/SCR	None	50-32-8	Benzo(a)pyrene	9.16E-05	1.39E-05	2.57E-06	lbs/MMcf	1.36E-08
4603	Turbine	Natural gas	20200203	COC/SCR	None	205-99-2	Benzo(b)fluoranthene	6.72E-05	1.13E-05	2.87E-06	lbs/MMcf	1.11E-08
4618	Turbine	Natural gas	20200203	COC/SCR	None	207-08-9	Benzo(k)fluoranthene	6.72E-05	1.10E-05	2.87E-06	lbs/MMcf	1.08E-08
4623	Turbine	Natural gas	20200203	COC/SCR	None	218-01-9	Chrysene	1.50E-04	2.52E-05	4.99E-06	lbs/MMcf	2.47E-08
4628	Turbine	Natural gas	20200203	COC/SCR	None	53-70-3	Dibenz(a,h)anthracene	1.34E-04	2.35E-05	3.03E-06	lbs/MMcf	2.30E-08
4633	Turbine	Natural gas	20200203	COC/SCR	None	100-41-4	Ethylbenzene	5.70E-02	1.79E-02	9.74E-03	lbs/MMcf	1.75E-05
4648	Turbine	Natural gas	20200203	COC/SCR	None	50-00-0	Formaldehyde	6.87E+00	9.17E-01	1.12E-01	lbs/MMcf	8.99E-04
4653	Turbine	Natural gas	20200203	COC/SCR	None	110-54-3	Hexane	3.82E-01	2.59E-01	2.19E-01	lbs/MMcf	2.54E-04
4658	Turbine	Natural gas	20200203	COC/SCR	None	193-39-5	Indeno(1,2,3-cd)pyrene	1.34E-04	2.35E-05	2.87E-06	lbs/MMcf	2.30E-08
4663	Turbine	Natural gas	20200203	COC/SCR	None	91-20-3	Naphthalene	7.88E-03	1.66E-03	9.26E-04	lbs/MMcf	1.63E-06
4678	Turbine	Natural gas	20200203	COC/SCR	None	115-07-1	Propylene	2.00E+00	7.71E-01	5.71E-01	lbs/MMcf	7.56E-04
4683	Turbine	Natural gas	20200203	COC/SCR	None	75-56-9	Propylene Oxide	5.87E-02	4.78E-02	4.48E-02	lbs/MMcf	4.69E-05
4693	Turbine	Natural gas	20200203	COC/SCR	None	108-88-3	Toluene	1.68E-01	7.10E-02	5.91E-02	lbs/MMcf	6.96E-05
4708	Turbine	Natural gas	20200203	COC/SCR	None	1330-20-7	Xylene (Total)	6.26E-02	2.61E-02	1.93E-02	lbs/MMcf	2.56E-05
Natural Gas 1020 Btu/scf												

Mariposa Energy Project H₂SO₄ Estimates

H₂SO₄ Estimate

Worst Case lb/hr

1 grain Sulfur/100 scf

$$\text{lb S/MMBtu} = 1 \text{ grain S/100 scf} \times \text{lb/7000 grains} \times \text{scf/1020 Btu} \times 1\text{E}06 \text{ Btu/MMBtu} = 0.0014 \text{ lb S/MMBtu}$$

$$\text{lb SO}_2/\text{MMBtu} = 0.0014 \text{ lb S/MMBtu} \times 64/32 = 0.0028 \text{ lb SO}_2/\text{MMBtu}$$

Worst Case lb/hour assume 55% SO₂ converts to H₂SO₄

$$\text{lb H}_2\text{SO}_4/\text{MMBtu} = 0.0028 \text{ lb SO}_2/\text{MMBtu} \times 98/64 \times 0.55 = 0.002358 \text{ lb H}_2\text{SO}_4/\text{MMBtu}$$

$$\text{Simple Cycle Turbine lb/hr H}_2\text{SO}_4 = 481 \text{ MMBtu/hour} \times 0.002358 \text{ lb H}_2\text{SO}_4/\text{MMBtu} = 1.134 \text{ lb/hour per turbine}$$

Annual Average assume 55% SO₂ converts to H₂SO₄

0.25 grain Sulfur/100 scf

$$\text{lb S/MMBtu} = 0.25 \text{ grain S/100 scf} \times \text{lb/7000 grains} \times \text{scf/1020 Btu} \times 1\text{E}06 \text{ Btu/MMBtu} = 0.00035 \text{ lb S/MMBtu}$$

$$\text{lb SO}_2/\text{MMBtu} = 0.00035 \text{ lb S/MMBtu} \times 64/32 = 0.0007 \text{ lb SO}_2/\text{MMBtu}$$

Worst Case Annual Average lb/hour assume 55% SO₂ converts to H₂SO₄

$$\text{lb H}_2\text{SO}_4/\text{MMBtu} = 0.0007 \text{ lb SO}_2/\text{MMBtu} \times 98/64 \times 0.55 = 0.0005895 \text{ lb H}_2\text{SO}_4/\text{MMBtu}$$

$$\text{Simple Cycle Turbine lb/hr H}_2\text{SO}_4 = 481 \text{ MMBtu/hour} \times 0.0005895 \text{ lb H}_2\text{SO}_4/\text{MMBtu} = 0.2835 \text{ lb/hour per turbine}$$

$$\text{Total H}_2\text{SO}_4 = 4 \times (0.2835 \text{ lb/hour} \times 4300 \text{ hour/year}) = 4877.05 \text{ lb/year, 2.44 ton/year}$$

Appendix B
Health Risk Assessment Results

INTEROFFICE MEMORANDUM

August 11, 2009

TO: Madhav Patil

**Via: Scott Lutz
Daphne Chong**

FROM: Ted Hull

**SUBJECT: Results of Health Risk Screening Analysis for Mariposa Energy, LLC
(Byron, CA), Plant #19730, Application #020737**

SUMMARY: Per your request, we have completed a health risk screening analysis (HRSA) for the above referenced permit application. The analysis estimates the combined health risks associated with toxic air contaminant (TAC) emissions from a proposed power generation facility consisting of (4) natural gas fired combustion turbines. In addition, the analysis includes emissions from the non-emergency operation of a diesel IC engine used to drive a fire pump.

Results from the HRSA indicate that the maximum cancer risk is 1.3 in a million, the chronic hazard index is 0.015, and the acute hazard index is 0.026. In accordance with Regulation 2-5-301 these are acceptable project risks. It should be noted that nearly all of the worker cancer risk (1.3 in a million) is attributed to the non-emergency operation of the fire pump engine diesel engine. This risk level is considered acceptable, since it has been demonstrated that the engine meets the current TBACT emissions standard for diesel PM.

EMISSIONS: The emission rates for toxic air contaminants used in this evaluation are those provided in your memorandum. TAC emissions were adjusted for toxicity and assumed exposure levels, so that a single risk based emission value was entered for each source component (See Spreadsheet Tables 1 through 5). Model runs were set up to estimate the maximum project risk in the following categories: (1) Cancer Risk and (2) Chronic Hazard Index for Residential and Off-site Worker receptors; and (3) Acute Hazard Index for the maximally exposed receptor.

The California Air Resources Board's Hotspots Analysis and Reporting Program (HARP), version 1.4a was used to determine the Cancer, Chronic Hazard Index (HI) and Acute HI risk factors for each compound. In addition to the inhalation exposure pathway, the polycyclic aromatic hydrocarbon group (PAH) also has cancer risks associated with oral ingestion and dermal exposure.

MODELING: The ISCST3 air dispersion computer model was used to estimate annual average and maximum 1-hour ambient air concentrations. Model runs were made with Screen3 meteorological data because actual data was not available for this area. Elevated terrain was considered using input from the USGS Altamont, Byron Hot Springs, Clifton-Court-Forebay,

and Midway digital elevation maps (NAD27 format). Model runs were made with Rural land use dispersion coefficients to best represent the area surrounding the facility. Stack parameters for the analysis were based on information provided by the applicant.

HEALTH RISK: Estimates of residential risk assume exposure to annual average TAC concentrations occur 24 hours per day, 350 days per year, for a 70-year lifetime. Risk estimates for offsite workers assume exposure occurs 8 hours per day, 245 day per year, for 40 years. Risk estimates for students assume a higher breathing rate, and exposure is assumed to occur 10 hours per day, 36 weeks per year, for 9 years. The estimated health risks for this permit application are presented in the table below.

Receptor	Cancer Risk	Non-cancer Hazard Index (HI)	Max. Acute Non-cancer HI
Resident	0.3 in a million	0.015	N/A
Worker	1.3 in a million	0.001	N/A
Any	N/A	N/A	0.026

Risk to Students was not calculated because there are no schools within 1,000 feet of the source.

Mariposa Energy Project Risk Screening Report

Health Risk Screening Analysis Summary for Gas Turbines Facility = Mariposa Energy, LLC (Byron, CA) - Plant #19370, Application #020737

Table 1: HARP Multipathway Unit Risk Factors - Gas Turbine

T/As	(HARP) Residential Cancer Risk Factors* (ugm/y)		(HARP) Residential Chronic HI Factors* (ugm/y)		(HARP) Worker Cancer Risk Factors* (ugm/y)		(HARP) Worker Chronic HI Factors* (ugm/y)		(HARP) Acute Hazard Index (HI) Factors* (ugm/y)	
	Residential Cancer Risk Factors* (ugm/y)	(HARP) Residential Chronic HI Factors* (ugm/y)	(HARP) Worker Cancer Risk Factors* (ugm/y)	(HARP) Worker Chronic HI Factors* (ugm/y)	(HARP) Acute Hazard Index (HI) Factors* (ugm/y)	(HARP) Worker Cancer Risk Factors* (ugm/y)	(HARP) Worker Chronic HI Factors* (ugm/y)	(HARP) Acute Hazard Index (HI) Factors* (ugm/y)	(HARP) Worker Cancer Risk Factors* (ugm/y)	(HARP) Worker Chronic HI Factors* (ugm/y)
Acetaldehyde	2.90E-08	7.14E-03	5.72E-07	7.14E-03	2.15E-03	2.88E+00	4.00E-01	2.15E-03	2.88E+00	4.00E-01
Acrolein	0.00E+00	2.88E+00	0.00E+00	2.88E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonia	0.00E+00	5.00E-03	0.00E+00	5.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2 Butadiene	1.74E-04	5.00E-02	3.43E-05	5.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	2.90E-05	1.97E-02	5.72E-08	1.97E-02	7.69E-04	5.00E-02	0.00E+00	7.69E-04	5.00E-02	0.00E+00
Ethylbenzene	2.52E-06	5.00E-04	4.97E-07	5.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	6.08E-06	1.11E-01	1.20E-08	1.11E-01	1.82E-02	1.20E-08	1.11E-01	1.82E-02	1.20E-08	1.11E-01
Heptane	0.00E+00	1.43E-04	0.00E+00	1.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Naphthalene	3.48E-05	1.11E-01	6.86E-06	1.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAH, as B[a]P	1.65E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Propylene Oxide	0.00E+00	3.33E-04	0.00E+00	3.33E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric Acid Mist	3.78E-06	7.43E-07	7.43E-07	7.43E-07	3.23E-04	0.00E+00	0.00E+00	3.23E-04	0.00E+00	0.00E+00
Toluene	0.00E+00	1.00E+00	0.00E+00	1.00E+00	8.33E-03	0.00E+00	0.00E+00	8.33E-03	0.00E+00	0.00E+00
Xylene	0.00E+00	3.33E-03	0.00E+00	3.33E-03	2.70E-05	0.00E+00	0.00E+00	2.70E-05	0.00E+00	0.00E+00

Notes:
1. HARP Version 1.4a, Derived Adjusted Method
2. HARP Version 1.4a, Derived OEHHA Method
3. HARP Version 1.4a, Point Estimate Method

Table 2: Exposure Adjustment Factors (EAFs) - Gas Turbine

Receptor	Presence During Source Operation				Potential for Exposure				Annual Exposure (%)		Exposure Adjustment Factors	
	Daily (hours/day)	Weekly (days/week)	Annually (weeks/year)	Annually (weeks/year)	Daily (hours/day)	Weekly (days/week)	Annually (weeks/year)	Annually (weeks/year)	Exposure Correction Factor	Exposure Correction Factor	Cancer	Chronic HI
Resident	24	7	50	50	11	7	50	98.2%	1.04	1.04	1.00	0.98
Worker	8	5	49	49	8	5	49	48.0%	4.47	4.47	2.19	0.49
Student	10	5	36	36	10	5	36	45.0%	4.87	4.87	2.19	0.45
Source Operation	11	7	52	52								

Note:
HARP chronic risk values assume 8,400 hours of residential exposure, 1,680 hours of worker exposure, and 1,680 hours of student exposure from a continuously operating source (8,760 hours/yr). Risk based emissions from sources that do not operate continuously are scaled to account for exposure outside these parameters.

Mariposa Energy Project Risk Screening Report

Health Risk Screening Analysis Summary for Gas Turbines Facility = Mariposa Energy, LLC (Byron, CA) - Plant #19370, Application #020737

Table 3: Resident - Cancer, Chronic, and Acute Risk Adjusted Total Emission Rates for Each Turbine

TACs	Annual Emission Rate (lb/yr)	Annual Emission Rate (g/hr)	Hourly Emission Rate (lb/hr)	Hourly Emission Rate (g/hr)	(HARP) Multi-Path Unit Cancer Risk Factor (log ₁₀ yr ⁻¹)	(HARP) Chronic Hazard Index (H _{CI}) per Unit Conc. (log ₁₀ yr ⁻¹)	(HARP) Acute Hazard Index (H _{AI}) per Unit Conc. (log ₁₀ yr ⁻¹)	Cancer Risk (in a million) (log ₁₀ yr ⁻¹)	Chronic HI Adjusted Emissions (g/yr)	Acute HI Adjusted Emissions (g/yr)
Acetaldehyde	2.78E+02	4.00E-03	6.46E-02	8.14E-03	2.90E-06	7.14E-03	2.13E-03	1.88E-02	2.78E-06	1.79E-06
Acetone	3.83E+01	5.51E-04	8.92E-03	1.12E-03	0.00E+00	2.96E-03	4.00E-01	0.00E+00	1.91E-03	4.00E-04
Ammonia	1.41E+04	2.03E-01	2.77E+00	3.47E-01	1.00E-05	1.00E-05	0.00E+00	0.00E+00	1.91E-03	1.91E-03
1,3 Butadiene	2.38E+01	3.41E-04	5.65E-03	7.12E-04	1.00E-05	1.00E-05	0.00E+00	0.00E+00	1.91E-03	1.91E-03
Benzene	2.70E+01	3.88E-04	6.38E-03	7.91E-04	2.95E-05	1.87E-02	7.68E-04	8.47E-04	1.78E-07	8.08E-07
Ethylbenzene	3.33E+01	5.22E-04	8.45E-03	1.05E-03	5.00E-04	5.00E-04	0.00E+00	1.32E-03	2.51E-07	0.00E+00
Formaldehyde	9.31E+02	1.34E-02	2.71E-01	3.40E-02	6.85E-06	1.11E-01	1.82E-02	8.16E-02	1.43E-03	4.88E-04
Heptane	5.26E+02	7.67E-03	1.23E-01	1.54E-02	0.00E+00	1.45E-04	0.00E+00	0.00E+00	1.04E-09	0.00E+00
Napthalene	3.37E+00	4.85E-05	7.95E-04	9.97E-05	3.48E-06	1.11E-01	0.00E+00	1.89E-03	5.17E-06	0.00E+00
PAHs as BbP	9.77E-02	1.39E-05	2.25E-04	2.81E-05	1.00E-05	1.00E-05	0.00E+00	0.00E+00	1.04E-09	0.00E+00
Propylene Oxide	9.70E+01	1.40E-03	2.38E-02	3.00E-03	0.00E+00	3.35E-04	0.00E+00	5.26E-03	7.18E-06	0.00E+00
Sulfuric Acid Mist	8.95E+02	1.27E-02	2.05E-01	2.56E-02	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.23E-02	2.16E-04
Toluene	1.44E+02	2.07E-03	3.35E-02	4.22E-03	0.00E+00	3.35E-03	2.70E-05	0.00E+00	6.83E-06	1.14E-07
Mean (Total)	5.30E+01	7.62E-04	1.25E-02	1.55E-03	0.00E+00	1.45E-03	4.55E-05	1.36E-01	1.03E-02	1.73E-03

1-Hour to Annual Ave. Concentration Conversion: 0.1

Table 4: Worker - Cancer, Chronic, and Acute Risk Adjusted Total Emission Rates for Each Turbine

TACs	Annual Emission Rate (lb/yr)	Annual Emission Rate (g/hr)	Hourly Emission Rate (lb/hr)	Hourly Emission Rate (g/hr)	(HARP) Multi-Path Unit Cancer Risk Factor (log ₁₀ yr ⁻¹)	(HARP) Chronic Hazard Index (H _{CI}) per Unit Conc. (log ₁₀ yr ⁻¹)	(HARP) Acute Hazard Index (H _{AI}) per Unit Conc. (log ₁₀ yr ⁻¹)	Cancer Risk (in a million) (log ₁₀ yr ⁻¹)	Chronic HI Adjusted Emissions (g/yr)	Acute HI Adjusted Emissions (g/yr)
Acetaldehyde	2.78E+02	4.00E-03	6.46E-02	8.14E-03	5.72E-07	7.14E-03	2.13E-03	5.00E-03	1.46E-05	1.79E-06
Acetone	3.83E+01	5.51E-04	8.92E-03	1.12E-03	0.00E+00	2.96E-03	4.00E-01	0.00E+00	7.71E-04	4.00E-04
Ammonia	1.41E+04	2.03E-01	2.77E+00	3.47E-01	0.00E+00	5.00E-03	3.18E-04	0.00E+00	4.98E-04	2.88E-04
1,3 Butadiene	2.38E+01	3.41E-04	5.65E-03	7.12E-04	0.00E+00	1.00E-05	0.00E+00	0.00E+00	3.17E-06	0.00E+00
Benzene	2.70E+01	3.88E-04	6.38E-03	7.91E-04	5.72E-06	1.87E-02	7.68E-04	4.48E-03	1.78E-07	8.08E-07
Ethylbenzene	3.33E+01	5.22E-04	8.45E-03	1.05E-03	4.97E-07	5.00E-04	0.00E+00	5.85E-04	2.28E-07	0.00E+00
Formaldehyde	9.31E+02	1.34E-02	2.71E-01	3.40E-02	1.20E-06	1.11E-01	1.82E-02	3.52E-02	7.28E-04	4.88E-04
Heptane	5.26E+02	7.67E-03	1.23E-01	1.54E-02	0.00E+00	1.45E-04	0.00E+00	0.00E+00	5.30E-07	0.00E+00
Napthalene	3.37E+00	4.85E-05	7.95E-04	9.97E-05	6.86E-06	1.11E-01	0.00E+00	1.73E-02	2.03E-06	0.00E+00
PAHs as BbP	9.77E-02	1.39E-05	2.25E-04	2.81E-05	0.00E+00	1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Propylene Oxide	9.70E+01	1.40E-03	2.38E-02	3.00E-03	7.43E-07	3.35E-04	0.00E+00	5.26E-03	2.27E-05	9.25E-07
Sulfuric Acid Mist	8.95E+02	1.27E-02	2.05E-01	2.56E-02	0.00E+00	1.00E+00	0.00E+00	0.00E+00	6.33E-03	2.16E-04
Toluene	1.44E+02	2.07E-03	3.35E-02	4.22E-03	0.00E+00	3.35E-03	2.70E-05	0.00E+00	3.38E-06	1.14E-07
Mean (Total)	5.30E+01	7.62E-04	1.25E-02	1.55E-03	0.00E+00	1.45E-03	4.55E-05	6.84E-02	5.34E-07	7.05E-08

1-Hour to Annual Ave. Concentration Conversion: 0.1

Mariposa Energy Project Risk Screening Report

Health Risk Screening Analysis Summary for Diesel Engine Facility = Mariposa Energy, LLC (Byron, CA) - Plant #19370, Application #020737

Table 5: Risk Based ISC Emissions Inputs - Diesel Engine

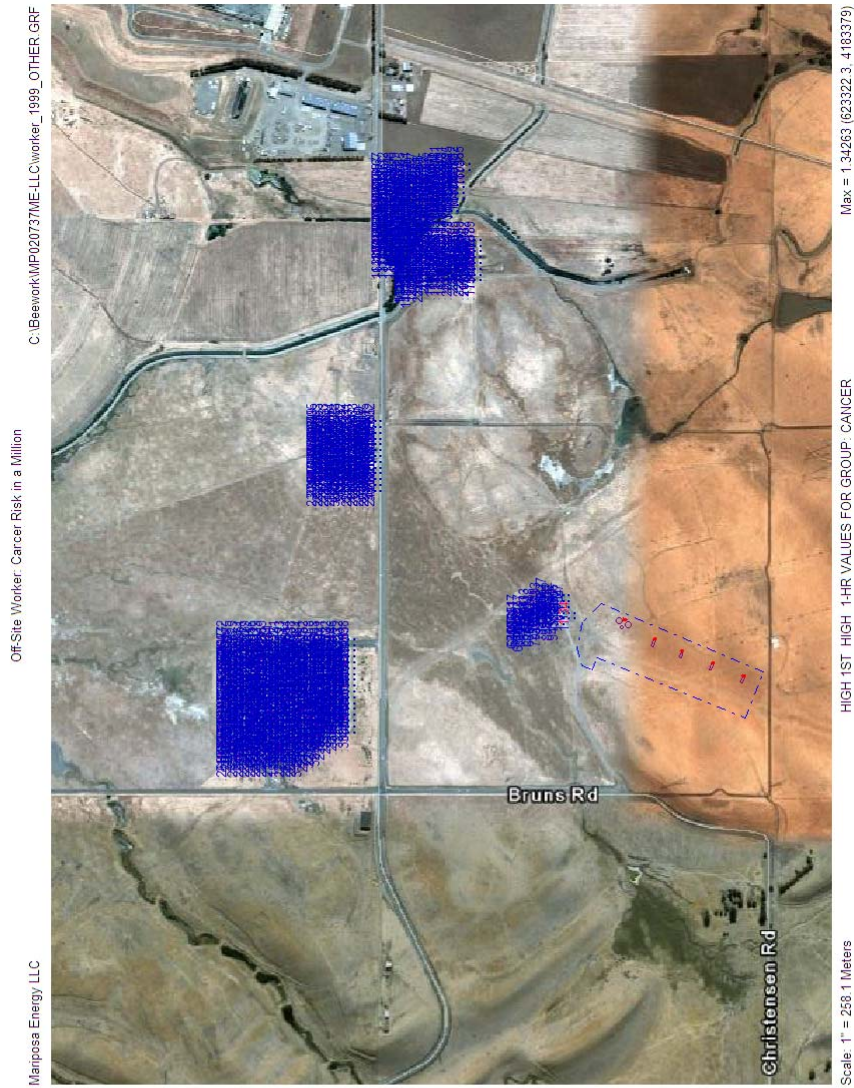
Source	Resident				Worker			
	Annual Emission Rate (lb/yr)	Annual Average Emission Rate (g/sec)	(HARP) Residential Cancer Risk Factor (gpm) ⁻¹	(HARP) Residential Chronic HI Factor (gpm) ⁻¹	Exposure Adjusted Cancer Risk (gpm) ⁻¹	Exposure Adjusted Chronic HI (gpm) ⁻¹	(HARP) Unadjusted Worker Cancer Risk Factor (gpm) ⁻¹	(HARP) Unadjusted Worker Chronic HI Factor (gpm) ⁻¹
S-5	3.08E+00	4.43E-05	3.19E-04	2.05E-01	1.47E-03	8.86E-08	6.29E-05	2.05E-01
1-Hour to Annual Ave. Concentration Conversion:				0.1	1.47E-03	8.86E-07	1.22E-02	1.22E-03
							1.22E-02	8.68E-08

Table 6: Exposure Adjustment Factors (EAFs) - Diesel Engine

Receptor	Presence During Source Operation				Potential for Exposure				Exposure Adjustment Factors			
	Daily (hours/day)	Weekly (days/week)	Annually (weeks/year)	Annually (hours/year)	Daily (hours/day)	Weekly (days/week)	Annually (weeks/year)	Annually (hours/year)	Annual Exposure (%)	Exposure Correction Factor	Cancer	Chronic HI
Resident	24	7	50	1	1	1	50	100.0%	100.0%	1.04	1.04	1.00
Worker	8	5	49	1	1	1	49	98.0%	98.0%	4.47	4.38	0.98
Student	10	5	36	1	1	1	36	72.0%	72.0%	4.87	3.50	0.72
Source Operation	1	1	50									

Note:
HARP cancer risk values assume 8,400 hours per year of residential exposure and 1,960 hours per year of worker exposure from a continuously operating source (8,760 hours/yr).
Risk based emissions from sources that do not operate continuously must be scaled to account for exposure outside these parameters.

Mariposa Energy Project Risk Screening Report



Mariposa Energy Project Risk Screening Report

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NO ECHO

BEZ-Line ISCST3 "BEEST" Version 9.00

Input File - C:\Beework\WP020737MS-LLC\worker_1999_OTHER.DTA
Output File - C:\Beework\WP020737MS-LLC\worker_1999_OTHER.LST
Met File - C:\Beework\metdata\screen3.asc

*** Message Summary For ISC3 Model Setup ***
----- Summary of Total Messages -----
A Total of      0 Fatal Error Message(s)
A Total of      1 Warning Message(s)
A Total of      0 Informational Message(s)

***** FATAL ERROR MESSAGES *****
*** NONE ***

***** WARNING MESSAGES *****
RE W282 1845 CHK_EL:RecElev < SrcBase; See non-DEFAULT HE>ZI option in MCB#9

***** SETUP Finishes Successfully *****
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Mariposa Energy Project Risk Screening Report

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*** ISCS73 - VERSION 02035 ***      *** Mariposa Energy LLC      08/10/09
*** Application #020737                                     11:23:36
***                                                                    PAGE 1

**MODELOPTs:
CONC      RURAL ELEV      DFAULT      ***      MODEL SETUP OPTIONS SUMMARY      ***

-- SCAVENGING/DEPOSITION LOGIC --
**Model Uses NO DRY DEPLETION. MDPLETE = F
**Model Uses NO WET DEPLETION. WDPLETE = F
**NO NET SCAVENGING DATA PROVIDED.
**NO GAS DRY DEPOSITION DATA PROVIDED.
**Model Does NOT Use GRIDDED TERRAIN Data for Depletion Calculations
**Model Uses RURAL Dispersion.
**Model Uses Regulatory DEFAULT Options:
1. Final Plume Rise.
2. Stack-tip Downwash.
3. Buoyancy-induced Dispersion.
4. Use Calms Processing Routine.
5. No Use Missing Data Processing Routine.
6. Default Meteorological Dispersion Model.
7. Default Vertical Potential Temperature Gradients.
8. "Upper Bound" Values for Supercooled Buildings.
9. No Exponential Decay for RURAL Mode
**Model Accepts Receptors on ELEV Terrain.
**Model Assumes NO FLAGPOLE Receptor Heights.
**Model Calculates 1 Short Term Average(s) of: 1-HR
**This Run Includes: 10 Source(s); 2 Source Group(s); and 1671 Receptor(s)
**The Model Assumes A Pollutant Type of: OTHER
**Model Set To Continue RUNNING After the Setup Testing.

**Output Options Selected:
Model Outputs Tables of Highest Short Term Values by Receptor (REXTABLE Keyword)
Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)

**NOTE: The Following Flags May Appear Following CONC Values: c for Calm Hours
m for Missing Hours
b for Both Calm and Missing Hours

**Misc. Inputs: Arem. Hgt. (m) = 10.00 ; Decay Coef. = 0.000 ; Rot. Angle = 0.0
Emission Units = GRAMS/SEC ; Emission Rate Unit Factor = 0.100002+07
Output Units = MICROGRAMS/M**3

**Approximate Storage Requirements of Model = 1.4 MB of RAM.

**Input Runstream File: worker_1999_OTHER.DTA
**Output Print File: worker_1999_OTHER.LST

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*** ISCST3 - VERSION 02035 ***      *** Mariposa Energy LLC
*** Application #020737
***MODELOPTs:
CONC                                RURAL ELEV      DEFAULT

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SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	*** POINT SOURCE DATA ***										BUILDING EMISSION RATE EXISTS SCALAR VARY BY
			X (METERS)	Y (METERS)	ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG. K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)				
061CAN	0	0.66400E-02	623264.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES			
062CAN	0	0.66400E-02	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES			
063CAN	0	0.66400E-02	623213.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES			
064CAN	0	0.66400E-02	623186.1	4183015.5	36.9	24.23	726.48	46.37	3.66	YES			
065CAN	0	0.66400E-02	623161.1	4182949.5	36.9	24.23	726.48	46.37	3.66	YES			
066CAN	0	0.66400E-02	623164.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES			
067CAN	0	0.66400E-02	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES			
068CAN	0	0.66400E-02	623213.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES			
069CAN	0	0.66400E-02	623186.1	4183015.5	36.9	24.23	726.48	46.37	3.66	YES			
070CAN	0	0.66400E-02	623161.1	4182949.5	36.9	24.23	726.48	46.37	3.66	YES			
071CAN	0	0.66400E-02	623164.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES			
072CAN	0	0.66400E-02	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES			
073CAN	0	0.66400E-02	623213.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES			
074CAN	0	0.66400E-02	623186.1	4183015.5	36.9	24.23	726.48	46.37	3.66	YES			
075CAN	0	0.66400E-02	623161.1	4182949.5	36.9	24.23	726.48	46.37	3.66	YES			
076CAN	0	0.66400E-02	623164.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES			
077CAN	0	0.66400E-02	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES			
078CAN	0	0.66400E-02	623213.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES			
079CAN	0	0.66400E-02	623186.1	4183015.5	36.9	24.23	726.48	46.37	3.66	YES			
080CAN	0	0.66400E-02	623161.1	4182949.5	36.9	24.23	726.48	46.37	3.66	YES			
081CAN	0	0.66400E-02	623164.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES			
082CAN	0	0.66400E-02	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES			
083CAN	0	0.66400E-02	623213.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES			
084CAN	0	0.66400E-02	623186.1	4183015.5	36.9	24.23	726.48	46.37	3.66	YES			
085CAN	0	0.66400E-02	623161.1	4182949.5	36.9	24.23	726.48	46.37	3.66	YES			
086CAN	0	0.66400E-02	623164.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES			
087CAN	0	0.66400E-02	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES			
088CAN	0	0.66400E-02	623213.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES			
089CAN	0	0.66400E-02	623186.1	4183015.5	36.9	24.23	726.48	46.37	3.66	YES			
090CAN	0	0.66400E-02	623161.1	4182949.5	36.9</								

*** SOURCE IDS DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
CANCER	S1CAN , S2CAN , S3CAN , S4CAN , S5CAN ,
CHRONIC	S1CHR , S2CHR , S3CHR , S4CHR , S5CHR ,

Mariposa Energy Project Risk Screening Report

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*** ISCST3 - VERSION 02035 ***
*** Mariposa Energy LLC
*** Application #020737

**MODELOPTS:

CONC RURAL ELEV

DEFAULT

*** DIRECTION SPECIFIC BUILDING DIMENSIONS ***

SOURCE ID: S1CAN
IFV BH BW WAK IFV BH BW WAK IFV BH BW WAK IFV BH BW WAK IFV BH BW WAK
1 10.1, 17.6, 0 2 10.1, 17.2, 0 3 10.1, 17.4, 0 4 10.1, 17.4, 0 5 10.1, 17.0, 0 6 10.1, 15.9, 0
7 10.1, 14.5, 0 8 10.1, 12.5, 0 9 10.1, 10.2, 0 10 10.1, 7.6, 0 11 10.1, 4.8, 0 12 10.1, 6.5, 0
13 10.1, 9.2, 0 14 10.1, 11.7, 0 15 10.1, 13.8, 0 16 10.1, 15.5, 0 17 10.1, 16.7, 0 18 10.1, 17.4, 0
19 10.1, 17.5, 0 20 13.7, 15.2, 0 21 13.7, 16.0, 0 22 10.1, 17.4, 0 23 10.1, 17.0, 0 24 10.1, 15.9, 0
25 10.1, 14.5, 0 26 10.1, 12.5, 0 27 10.1, 10.2, 0 28 10.1, 7.6, 0 29 10.1, 4.8, 0 30 10.1, 6.5, 0
31 10.1, 9.2, 0 32 10.1, 11.7, 0 33 10.1, 13.8, 0 34 10.1, 15.5, 0 35 10.1, 16.7, 0 36 10.1, 17.4, 0

SOURCE ID: S2CAN
IFV BH BW WAK IFV BH BW WAK IFV BH BW WAK IFV BH BW WAK IFV BH BW WAK
1 10.1, 17.6, 0 2 10.1, 17.3, 0 3 10.1, 17.4, 0 4 10.1, 17.4, 0 5 10.1, 16.9, 0 6 10.1, 15.9, 0
7 10.1, 14.5, 0 8 10.1, 12.5, 0 9 10.1, 10.2, 0 10 10.1, 7.5, 0 11 10.1, 4.7, 0 12 10.1, 6.5, 0
13 10.1, 9.2, 0 14 10.1, 11.7, 0 15 10.1, 13.8, 0 16 10.1, 15.5, 0 17 10.1, 16.8, 0 18 10.1, 17.5, 0
19 10.1, 17.5, 0 20 10.1, 17.3, 0 21 10.1, 17.4, 0 22 10.1, 17.4, 0 23 10.1, 16.9, 0 24 10.1, 15.9, 0
25 10.1, 14.5, 0 26 10.1, 12.4, 0 27 10.1, 10.1, 0 28 10.1, 7.5, 0 29 10.1, 4.7, 0 30 10.1, 6.7, 0
31 10.1, 9.4, 0 32 10.1, 11.8, 0 33 10.1, 13.9, 0 34 10.1, 15.6, 0 35 10.1, 16.8, 0 36 10.1, 17.5, 0

SOURCE ID: S3CAN
IFV BH BW WAK IFV BH BW WAK IFV BH BW WAK IFV BH BW WAK IFV BH BW WAK
1 10.1, 17.6, 0 2 10.1, 17.2, 0 3 10.1, 17.4, 0 4 10.1, 17.4, 0 5 10.1, 16.9, 0 6 10.1, 15.9, 0
7 10.1, 14.5, 0 8 10.1, 12.4, 0 9 10.1, 10.1, 0 10 10.1, 7.5, 0 11 10.1, 4.6, 0 12 10.1, 6.7, 0
13 10.1, 9.5, 0 14 10.1, 11.9, 0 15 10.1, 14.0, 0 16 10.1, 15.6, 0 17 10.1, 16.8, 0 18 10.1, 17.5, 0
19 10.1, 17.6, 0 20 10.1, 17.2, 0 21 10.1, 17.4, 0 22 10.1, 17.4, 0 23 10.1, 16.9, 0 24 10.1, 15.9, 0
25 10.1, 14.5, 0 26 10.1, 12.4, 0 27 10.1, 10.1, 0 28 10.1, 7.5, 0 29 10.1, 4.6, 0 30 10.1, 6.7, 0
31 10.1, 9.5, 0 32 10.1, 11.5, 0 33 10.1, 14.0, 0 34 10.1, 15.6, 0 35 10.1, 16.8, 0 36 10.1, 17.5, 0

SOURCE ID: S4CAN
IFV BH BW WAK IFV BH BW WAK IFV BH BW WAK IFV BH BW WAK IFV BH BW WAK
1 10.1, 17.5, 0 2 10.1, 17.2, 0 3 10.1, 17.5, 0 4 10.1, 17.5, 0 5 10.1, 17.0, 0 6 10.1, 16.0, 0
7 10.1, 14.6, 0 8 10.1, 12.6, 0 9 10.1, 10.3, 0 10 10.1, 7.7, 0 11 10.1, 4.9, 0 12 10.1, 6.6, 0
13 10.1, 9.3, 0 14 10.1, 11.8, 0 15 10.1, 13.8, 0 16 10.1, 15.5, 0 17 10.1, 16.7, 0 18 10.1, 17.4, 0
19 10.1, 17.5, 0 20 10.1, 17.2, 0 21 10.1, 17.5, 0 22 10.1, 17.5, 0 23 10.1, 17.0, 0 24 10.1, 16.0, 0
25 10.1, 14.6, 0 26 10.1, 12.6, 0 27 10.1, 10.3, 0 28 10.1, 7.7, 0 29 10.1, 4.9, 0 30 10.1, 6.6, 0
31 10.1, 9.3, 0 32 10.1, 11.8, 0 33 10.1, 13.8, 0 34 10.1, 15.5, 0 35 10.1, 16.7, 0 36 10.1, 17.4, 0

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Risk Screening Report**



Mariposa Energy Project Risk Screening Report

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*** Mariposa Energy LLC
*** Application #020737

*** ISCET3 - VERSION 02035 ***

**MODELOPTS:

CONC RURAL ELEV

DEFAULT

*** DIRECTION SPECIFIC BUILDING DIMENSIONS ***

SOURCE ID: S4CHR

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	10.1	17.5	0	2	10.1	17.2	0	3	10.1	17.5	0	4	10.1	17.5	0	5	10.1	17.0	0
7	10.1	14.6	0	8	10.1	12.6	0	9	10.1	10.3	0	10	10.1	10.3	0	11	10.1	4.9	0
13	10.1	9.3	0	14	10.1	11.8	0	15	10.1	13.8	0	16	10.1	15.5	0	17	10.1	16.7	0
19	10.1	17.5	0	20	10.1	17.2	0	21	10.1	17.5	0	22	10.1	17.5	0	23	10.1	17.0	0
25	10.1	14.6	0	26	10.1	12.6	0	27	10.1	10.3	0	28	10.1	10.3	0	29	10.1	4.9	0
31	10.1	9.3	0	32	10.1	11.8	0	33	10.1	13.8	0	34	10.1	15.5	0	35	10.1	16.7	0
																36	10.1	17.4	0

SOURCE ID: S5CHR

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	13.7	18.9	0	2	13.7	15.2	0	3	13.7	16.0	0	4	13.7	19.6	0	5	13.7	23.1	0
13	13.7	29.3	0	14	13.7	31.1	0	15	13.7	33.5	0	16	13.7	34.7	0	17	13.7	35.3	0
19	13.7	18.9	0	20	13.7	15.2	0	21	13.7	16.0	0	22	13.7	19.6	0	23	13.7	23.1	0
25	13.7	29.3	0	26	13.7	31.1	0	27	13.7	33.5	0	28	13.7	34.7	0	29	13.7	35.3	0
31	13.7	34.5	0	32	13.7	33.1	0	33	13.7	31.2	0	34	13.7	28.7	0	35	13.7	25.8	0
																36	13.7	22.5	0

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*** ISCST3 - VERSION 02035 ***
*** Mariposa Energy LLC
*** Application #020737

**MODELOPTS:
CONC          RURAL ELEV      DFAULT

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*** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
(1=YES, 0=NO)

NOTE: METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

*** WIND PROFILE EXPONENTS ***

STABILITY CATEGORY	WIND SPEED CATEGORY					
	1	2	3	4	5	6
A	7000E-01	7000E-01	7000E-01	7000E-01	7000E-01	7000E-01
B	7000E-01	7000E-01	7000E-01	7000E-01	7000E-01	7000E-01
C	1000E+00	1000E+00	1000E+00	1000E+00	1000E+00	1000E+00
D	1500E+00	1500E+00	1500E+00	1500E+00	1500E+00	1500E+00
E	3500E+00	3500E+00	3500E+00	3500E+00	3500E+00	3500E+00
F	5500E+00	5500E+00	5500E+00	5500E+00	5500E+00	5500E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY CATEGORY	WIND SPEED CATEGORY					
	1	2	3	4	5	6
A	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00
B	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00
C	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00
D	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00
E	.2000E-01	.2000E-01	.2000E-01	.2000E-01	.2000E-01	.2000E-01
F	.3500E-01	.3500E-01	.3500E-01	.3500E-01	.3500E-01	.3500E-01

Mariposa Energy Project Risk Screening Report

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*** ISCST3 - VERSION 02035 ***
**MODELOFTS:
CONC

RURAL ELEV DEFALT

*** THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

FILE: screen3.asc
FORMAT: (412.2F9.4,F6.1,12.2F7.1,F9.4,F10.1,F8.4,14.4F7.2)
SURFACE STATION NO.: 99999
NAME: YEAR: 1999

UPPER AIR STATION NO.: 99999
NAME: YEAR: 1999

YR	MO	DAY	HR	VECTOR	FLON	SPEED	TEMP	STAB	MIXING HEIGHT (M)	USTAR	M-O LENGTH (M)	Z-O LENGTH (M)	Z-O IFCODE	PRATE (mm/hr)
						(M/S)	(K)	CLASS	RURAL	URBAN	(M/S)	(M)		
99	01	01	01	5.0	1.00	293.0	1	320.0	320.0	0.0000	0.0	0.0000	0	0.00
99	01	01	02	5.0	1.50	293.0	1	480.0	480.0	0.0000	0.0	0.0000	0	0.00
99	01	01	03	5.0	2.00	293.0	1	640.0	640.0	0.0000	0.0	0.0000	0	0.00
99	01	01	04	5.0	2.50	293.0	1	800.0	800.0	0.0000	0.0	0.0000	0	0.00
99	01	01	05	5.0	3.00	293.0	1	960.0	960.0	0.0000	0.0	0.0000	0	0.00
99	01	01	06	5.0	3.50	293.0	1	1120.0	1120.0	0.0000	0.0	0.0000	0	0.00
99	01	01	07	5.0	4.00	293.0	2	1280.0	1280.0	0.0000	0.0	0.0000	0	0.00
99	01	01	08	5.0	4.50	293.0	2	1440.0	1440.0	0.0000	0.0	0.0000	0	0.00
99	01	01	09	5.0	5.00	293.0	2	1600.0	1600.0	0.0000	0.0	0.0000	0	0.00
99	01	01	10	5.0	5.50	293.0	2	1760.0	1760.0	0.0000	0.0	0.0000	0	0.00
99	01	01	11	5.0	6.00	293.0	2	1920.0	1920.0	0.0000	0.0	0.0000	0	0.00
99	01	01	12	5.0	6.50	293.0	2	2080.0	2080.0	0.0000	0.0	0.0000	0	0.00
99	01	01	13	5.0	7.00	293.0	2	2240.0	2240.0	0.0000	0.0	0.0000	0	0.00
99	01	01	14	5.0	7.50	293.0	2	2400.0	2400.0	0.0000	0.0	0.0000	0	0.00
99	01	01	15	5.0	8.00	293.0	2	2560.0	2560.0	0.0000	0.0	0.0000	0	0.00
99	01	01	16	5.0	8.50	293.0	3	2720.0	2720.0	0.0000	0.0	0.0000	0	0.00
99	01	01	17	5.0	9.00	293.0	3	2880.0	2880.0	0.0000	0.0	0.0000	0	0.00
99	01	01	18	5.0	9.50	293.0	3	3040.0	3040.0	0.0000	0.0	0.0000	0	0.00
99	01	01	19	5.0	10.00	293.0	3	3200.0	3200.0	0.0000	0.0	0.0000	0	0.00
99	01	01	20	5.0	10.50	293.0	3	3360.0	3360.0	0.0000	0.0	0.0000	0	0.00
99	01	01	21	5.0	11.00	293.0	3	3520.0	3520.0	0.0000	0.0	0.0000	0	0.00
99	01	01	22	5.0	11.50	293.0	3	3680.0	3680.0	0.0000	0.0	0.0000	0	0.00
99	01	01	23	5.0	12.00	293.0	3	3840.0	3840.0	0.0000	0.0	0.0000	0	0.00
99	01	01	24	5.0	12.50	293.0	3	4000.0	4000.0	0.0000	0.0	0.0000	0	0.00

*** NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.
FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

Mariposa Energy Project Risk Screening Report

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*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

*** CONC OF OTHER IN MICROGRAMS/M**3 **

*** Mariposa Energy LLC
*** Application #020737

CONC RURAL ELEV DFALT

GROUP ID	AVERAGE CONC	DATE (YYMMDDHH)	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	GRID-ID
CANCER HIGH 1ST HIGH VALUE IS	1.34263	ON 99010408: AT (623322.31,	4183379.00,	33.50,	0.00) DC NA
CANCER HIGH 2ND HIGH VALUE IS	1.28731	ON 99010918: AT (623347.31,	4183391.50,	33.10,	0.00) DC NA
CHRONIC HIGH 1ST HIGH VALUE IS	0.00127	ON 99012523: AT (624275.75,	4183743.50,	20.00,	0.00) DC NA
CHRONIC HIGH 2ND HIGH VALUE IS	0.00126	ON 99012317: AT (624275.75,	4183781.00,	19.00,	0.00) DC NA

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLAR
DP = DISCARD
IP = DISCARD
ED = BOUNDARY

*** Message Summary : ISCST3 Model Execution ***

----- Summary of Total Messages -----

A Total of 0 Fatal Error Message(s)
A Total of 1 Warning Message(s)
A Total of 0 Informational Message(s)

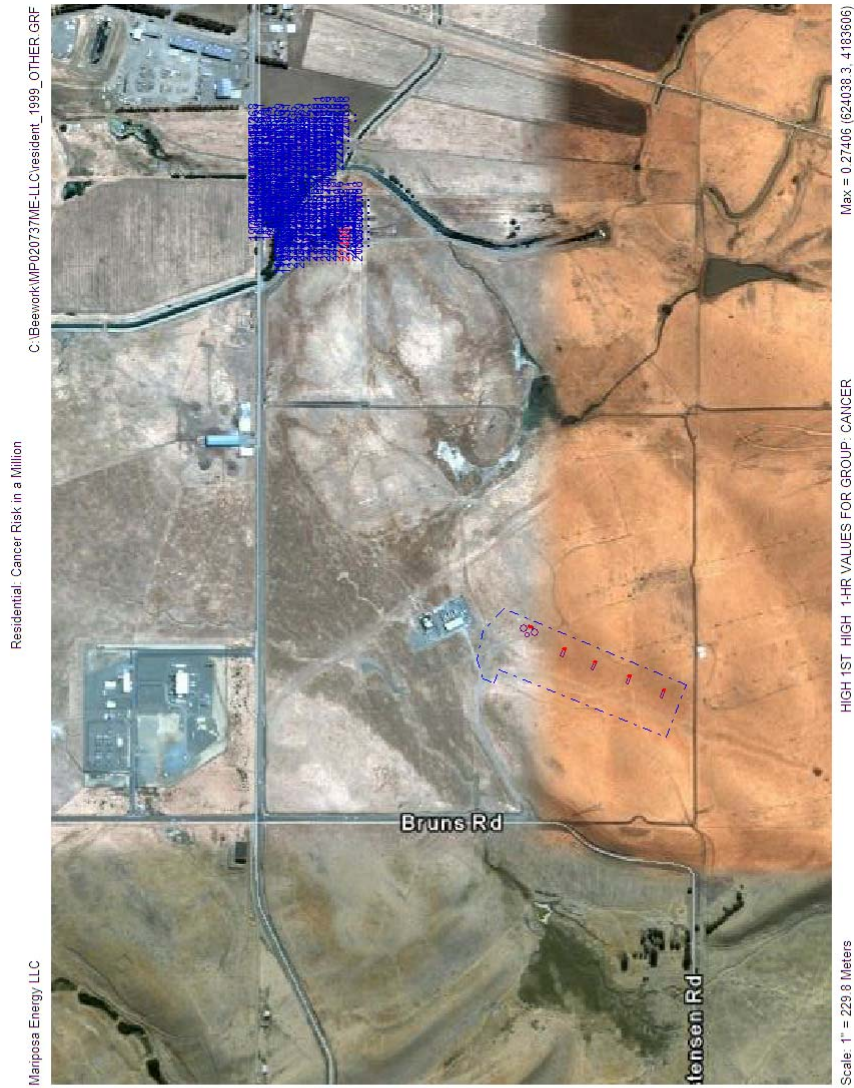
***** FATAL ERROR MESSAGES *****
*** NONE ***

***** WARNING MESSAGES *****

RE M282 1845 CHK_EL.RechElev < SrcBase; See non-DEFAULT HE>2I option in MCB#9

*** ISCST3 Finishes Successfully ***

Mariposa Energy Project Risk Screening Report



Mariposa Energy Project Risk Screening Report

worker_1999_OTHER

*** ISCST3 - VERSION 0203S ***
 *** Mariposa Energy LLC ***
 *** Model Executed on 8/10/09 at 16:37:31 ***
 Input File - C:\Beework\WP02037ME-LLC\worker_1999_OTHER.DTA
 Output File - C:\Beework\WP02037ME-LLC\worker_1999_OTHER.LST
 Net File - C:\Beework\metdata\screen3.asc
 Number of sources - 10
 Number of source groups - 3
 Number of receptors - 1671

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER EMISSION RATE PART. CATS.	NUMBER EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR	VARY BY
S1CAN	0	0.66400E-02	623264.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES		
S2CAN	0	0.66400E-02	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES		
S3CAN	0	0.66400E-02	623183.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES		
S4CAN	0	0.66400E-02	623183.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES		
S1CHR	0	0.12200E-02	623306.6	4183270.8	36.6	3.66	740.93	35.26	0.15	YES		
S2CHR	0	0.82800E-03	623264.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES		
S3CHR	0	0.82800E-03	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES		
S4CHR	0	0.82800E-03	623183.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES		
S5CHR	0	0.12200E-02	623183.3	4183081.2	36.6	3.66	740.93	35.26	0.15	YES		
S6CHR	0	0.82800E-03	623306.6	4183270.8	36.6	3.66	740.93	35.26	0.15	YES		

*** SOURCE IDS DEFINING SOURCE GROUPS ***

SOURCE IDS

GROUP ID

CANCER S1CAN , S2CAN , S3CAN , S4CAN , S5CAN ,
 CHRONIC S1CHR , S2CHR , S3CHR , S4CHR , S5CHR ,
 ICECAN S5CAN ,

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

** CONC OF OTHER IN MICROGRAMS/M**3

GROUP ID	DATE (YYMMDDHH)	AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
CANCER HIGH 1ST HIGH VALUE IS	1.34263 ON 99010408: AT { 623322.31, 4183379.00,	1.34263	33.50,	0.00) DC	NA
CANCER HIGH 2ND HIGH VALUE IS	1.28731 ON 99010918: AT { 623347.31, 4183391.50,	1.28731	33.10,	0.00) DC	NA
CHRONIC HIGH 1ST HIGH VALUE IS	0.00127 ON 99012523: AT { 624275.75, 4183743.50,	0.00127	20.00,	0.00) DC	NA
CHRONIC HIGH 2ND HIGH VALUE IS	0.00126 ON 99012317: AT { 624275.75, 4183781.00,	0.00126	19.00,	0.00) DC	NA
ICECAN HIGH 1ST HIGH VALUE IS	1.34263 ON 99010408: AT { 623322.31, 4183379.00,	1.34263	33.50,	0.00) DC	NA
ICECAN HIGH 2ND HIGH VALUE IS	1.28676 ON 99010918: AT { 623347.31, 4183391.50,	1.28676	33.10,	0.00) DC	NA

Mariposa Energy Project Risk Screening Report

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*** TSCF3 - VERSION 02035 ***
*** Mode Executed on 08/10/09 at 10:25:07 ***
Input File - c:\beework\WP02073ME-LLC\resident_1999_OTHER.DTA
Output File - c:\beework\WP02073ME-LLC\resident_1999_OTHER.LST
Met File - c:\beework\metdata\screen3.asc

Number of sources - 10
Number of source groups - 2
Number of receptors - 1154

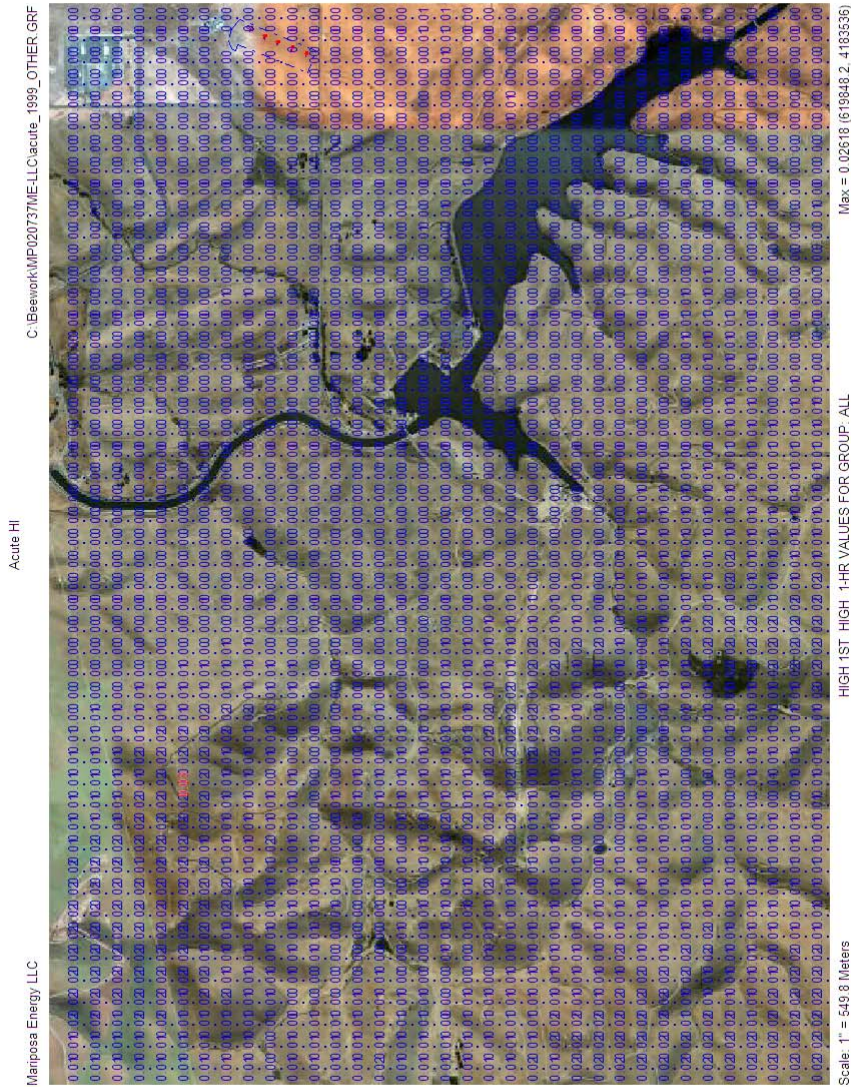
*** POINT SOURCE DATA ***
SOURCE ID NUMBER EMISSION RATE BASE HEIGHT STACK STACK STACK BUILDING EXISTENCE DATE
CATS (GRAMS/SEC) (METERS) (METERS) (DEG.K) (M/SEC) (METERS) EXISTENCE SCALAR VARY
-----
S1CAN 0 0.13600E-01 623264.9 4183205.5 36.9 24.23 726.48 46.37 3.66 YES
S2CAN 0 0.13600E-01 623213.3 4183081.2 36.9 24.23 726.48 46.37 3.66 YES
S3CAN 0 0.13600E-01 623213.3 4183081.2 36.9 24.23 726.48 46.37 3.66 YES
S4CAN 0 0.13600E-01 623186.1 4183015.5 36.9 24.23 726.48 46.37 3.66 YES
S5CAN 0 0.14700E-02 623306.6 4183270.8 36.6 3.66 740.93 35.26 0.15 YES
S1CHR 0 0.16300E-02 623264.9 4183205.5 36.9 24.23 726.48 46.37 3.66 YES
S2CHR 0 0.16300E-02 623213.3 4183081.2 36.9 24.23 726.48 46.37 3.66 YES
S3CHR 0 0.16300E-02 623213.3 4183081.2 36.9 24.23 726.48 46.37 3.66 YES
S4CHR 0 0.16300E-02 623186.1 4183015.5 36.9 24.23 726.48 46.37 3.66 YES
S5CHR 0 0.88600E-06 623306.6 4183270.8 36.6 3.66 740.93 35.26 0.15 YES

*** SOURCE IDS DEFINING SOURCE GROUPS ***
SOURCE IDS
GROUP ID SOURCE IDS
CANCER S1CAN , S2CAN , S3CAN , S4CAN , S5CAN ,
CHRONIC S1CHR , S2CHR , S3CHR , S4CHR , S5CHR ,

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***
** CONC OF OTHER IN MICROGRAMS/M**3 **
GROUP ID AVERAGE CONC DATE RECEPTOR (XR, YR, ZELV, ZELAG) OF TYPE NETWORK
CANCER HIGH 1ST HIGH VALUE IS 0.27406 ON 99012924: AT { 624038.25, 4183606.00, 22.90, DC NA
HIGH 2ND HIGH VALUE IS 0.21477 ON 99013001: AT { 624038.25, 4183606.00, 22.90, DC NA
CHRONIC HIGH 1ST HIGH VALUE IS 0.01125 ON 99042024: AT { 61644.25, 4180092.30, 254.40, DC NA
HIGH 2ND HIGH VALUE IS 0.01125 ON 99041818: AT { 61644.25, 4180092.30, 254.40, DC NA

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Mariposa Energy Project Risk Screening Report



Mariposa Energy Project Risk Screening Report

*** ISCST3 - VERSION 02035 ***
 *** Mariposa Energy LLC ***
 *** Model Executed on 08/10/09 at 15:19:10 ***
 Input File - C:\Beework\MP020737ME-LLC\acute_1999_OTHER.DTA
 Output File - C:\Beework\MP020737ME-LLC\acute_1999_OTHER.LST
 Met File - C:\Beework\metdata\screen3.asc
 Number of sources - 4
 Number of source groups - 1
 Number of receptors - 3571

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER EMISSION RATE PART. CATS.	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EMISSION RATE EXISTS	EMISION RATE SCALAR VARY BY
S1	0	623264.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES	
S2	0	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES	
S3	0	623213.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES	
S4	0	623186.1	4183015.5	36.9	24.23	726.48	46.37	3.66	YES	

*** SOURCE IDS DEFINING SOURCE GROUPS ***

SOURCE IDS

ALL S1 , S2 , S3 , S4 ,

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

** CONC OF OTHER IN MICROGRAMS/M**3

GROUP ID	DATE (YYMMDDHH)	AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
ALL	01/02/18	0.02618	ON 99050306: AT { 619848.19, 4183335.50, 231.60,	DC	NA
HIGH	01/02/18	0.02618	ON 99050412: AT { 619848.19, 4183335.50, 231.60,	DC	NA
HIGH	01/02/18	0.02618	ON 99050412: AT { 619848.19, 4183335.50, 231.60,	DC	NA



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Stephen Stanley <Stephen.Stanley.107620545@p2a.co>

Fri, Sep 21, 2018 at 5:46 PM

Reply-To: steve.stanley@dominionenergy.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Stephen Stanley
[7904 Wood Mill Dr](#)
[Richmond, VA 23231](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Deny Air Permit for ACP Compressor Station

1 message

georgianne stinnett <geostinnett@hotmail.com>

Fri, Sep 21, 2018 at 10:54 PM

To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>

Cc: "michael.dowd@deq.virginia.gov" <michael.dowd@deq.virginia.gov>, "patrick.corbett@deq.virginia.gov" <patrick.corbett@deq.virginia.gov>

My name is Georgianne Stinnett and I am a home and land owner within the affected zone of the proposed compressor station. Eight generations of my family have called Buckingham home and those who are still here include those most vulnerable to dangerous effects of air pollution – young children and the 92 year-old matriarch of the family who has lung cancer. I also have bronchiectasis and enjoy escaping from Richmond to my home in Buckingham where the air now feels clean. Emissions from the compressor station will destroy my ability to do this as well as lower my property value.

I also am a former environmental scientist who worked for years under contract to the EPA to ensure that the environment remains a place where everyone can live free of the devastating effects of industrial pollution. With this legacy and background, I am terrified of the thought of one of the largest compressor stations ever built being sited in Union Hill under the flimsy so called protections of this permit.

First, the specifications for the equipment on the facility are “for informational purposes only and do not form enforceable terms or conditions of the permit”. This alone should be enough to reject the permit – how can something of this potentially lethal magnitude be approved if we do not even know what it comprises. Further, the legality of the Special Use Permit issued by the Buckingham Board of Supervisors is still under legal challenge; why proceed with an application for an air permit if the status of the SUP is unclear.

The description of emission controls states that the owner operator is responsible for complying with monitoring requirements and that written documentation shall be maintained explaining the sufficiency of practices. The assumption here, that Dominion will do what is right, is grossly misplaced. The procedure described amounts to self-regulation; given Dominion’s and the gas transmission industry’s history of environmental disasters, putting them in charge of making sure they are keeping us safe is preposterous. Also, the time allowed the operator to report

violations that they discover is almost half of a year! This does not provide protection from the lethal effects of the emissions.

Why is there no mention of controlling air emissions in the event of explosions? How about escape routes for individuals who would still need to breathe during these events? Why are there no pollution controls during blowdowns?

This compressor station as proposed is a blatant example of environmental racism and would disproportionately affect the predominately African American community of Union Hill. The date used to measure impact in effect erases the community by averaging minority population across the entire county and ignoring how people, and their families and friends who come to visit, are concentrated around the proposed site. Until an accurate description of the location of the affected community is included in the permit decision making process, a decision on permitting must be delayed.

The system for measuring emissions does not account for the actual impacts of the emissions on human health. The samples are averaged on a regional scale and include times when fewer pollutants are being emitted. This effectively, and quite deliberately by Dominion, disguises blasts of high concentrations of noxious pollutants and misrepresents the air immediately surrounding the station. This is like saying that it is safe to walk in a gun range between the lines of shooters and targets because the bullets do not take up much of the overall airspace and they are only in the air for brief periods of time. Given the documented deterioration of community health near existing compressor stations the DEQ must conduct Quantified Risk, Health Risk, and Health Impact Assessments. You must deny this permit because it does not protect human health.

Georgianne Stinnett, [1226 Stanhope Avenue, Richmond, VA 23227](#) also
[2268 Greenway Road](#), Gladstone, VA 24553

Sent from [Outlook](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station1 message

Beth Stockner <pr.voga@gmail.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 3:48 PM

Dear Department of Environmental Quality:

On behalf of the Virginia Oil and Gas Association (VOGA), I appreciate the opportunity to submit our comments on the draft air quality permit for the Buckingham Compressor Station. As you know, the station is an integral part of the Atlantic Coast Pipeline, VOGA, along with many other members of the Commonwealth's business community, have strongly supported the project. We believe our state's continued economic health and growth depends upon a secure, reliable and affordable supply of energy. The Atlantic Coast Pipeline (ACP) is a key to achieving that goal.

We appreciate the dedication your department has shown in reviewing the ACP project and we are confident that the developers will meet and/or exceed the permit's strong requirements for air quality protection.

Thank you for the opportunity to offer our comments on this important regulatory matter.

Sincerely,

Beth Stockner
Public Relations Manager
Virginia Oil and Gas Association
(276) 608-8224- Abingdon
(276) 207-8284.- Norton



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Joel Sullivan <Joel.Sullivan.112664983@p2a.co>

Fri, Sep 21, 2018 at 6:06 PM

Reply-To: chor779@comcast.net

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Joel Sullivan
[2013 Samuels Rd](#)
[Elkton, VA 22827](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Gary Sypolt <Gary.Sypolt.112680291@p2a.co>

Fri, Sep 21, 2018 at 5:31 PM

Reply-To: gsypolt@comcast.net

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Gary Sypolt
[14540 Sarum Terrace](#)
[Midlothian, VA 23113](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Atlantic Coast Pipeline Union Hill Compressor Station Citizen Comment

1 message

Amanda Tandy <amanda.m.tandy@gmail.com>

Fri, Sep 21, 2018 at 6:23 PM

To: airdivision1@deq.virginia.gov, michael.dowd@deq.virginia.gov, patrick.corbett@deq.virginia.gov

Hello,

Thank you for taking public comments on the Atlantic Coast Pipeline (ACP) Union Hill Compressor Station (Compressor). As a citizen of the Commonwealth of Virginia, I am concerned that this unnecessary and dangerous project has been allowed to progress as much as it has given the opacity of the information available to citizens, especially directly affected citizens in Buckingham County, VA, and the risks involved in a project of this type and size.

I would like to ask the following of the Virginia Air Pollution Control Board:

1) Please extend the comment period for another twenty-one (21) days. This will give community members adequate time to review the documents recently delivered to the Buckingham Library with technical experts and fully understand what they mean and what the impacts are.

2) The Department of Environmental Quality (DEQ) should immediately complete a Quantified Risk Assessment (QRA) for the Buckingham Compressor Station prior to permitting and to work with other state agencies to conduct a Health Risk Assessment (HRA) and a Health Impact Assessment (HRI) for the Compressor. There is no good reason why, if this is one of the safest and most stringently regulated projects in the Commonwealth, the QRA and HRI should be foregone. DEQ should force ACP constructors to prove that this is not harmful, not wait for them to impact the community and then have a half-effort mitigation job.

3) The ACP constructor has been cited repeatedly for incorrect, incomplete and shoddy work even by DEQ staff in ACP's draft air permit, as well as by ACHP in their historic cultural resource report for Union Hill, yet their incomplete and inaccurate information is accepted by the Federal Energy Regulatory Commission (FERC) and DEQ for use in decision making. An example of this is that the ACP constructor cynically erased the existence of Union Hill as a known community with its 99 households within the one (1) mile radius of the Compressor site. In their 2015 FERC application and in all local and state permit processes both written and submitted at public hearings, the ACP constructor used the 2010 census average person per square mile data for the whole of Buckingham County –29.6 –to report the population impacted by the Compressor. They obviously did not do a thorough site review or they would have realized the 99 homes are there and that their use of five (5) year old data was woefully inaccurate. They would also not have submitted incorrect photos and data detailing the historic significance of the Union Hill community. I would ask that the Virginia Air Pollution Control Board force the ACP constructor to remedy the inaccuracies in their applications and backup documentation, apply the correct laws and regulations to the revised population count and then resubmit their application for review.

I would appreciate confirmation of the acceptance of this comment.

Thank you for your work in protecting Virginia's air,

Amanda Tandy

Leesburg, VA



Air Division 1, rr <airdivision1@deq.virginia.gov>

Public Comment: Please stop the Buckingham Compressor Station

1 message

Chris Tandy <chris@christandy.net>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 12:54 PM

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

I respectfully urge you to deny the draft minor source air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station.

I have done my own research on contaminants that are commonly emitted from compressor stations, have travelled to Buckingham County, and am convinced that it's inappropriate to build a compressor station in Buckingham. To be clear, I don't want the compressor to be built anywhere because of the global warming potential of methane emissions, but it's also clear that there's an aspect of environmental racism at work regarding the selection of Union Hill as the location for the only compressor in Virginia on the Atlantic Coast Pipeline(ACP) route.

I do not trust Dominion / ACP to mitigate pollution as much as possible. On the health impacts of exposure to toxins from the compressor, I'm not convinced that adequate protections will be taken. The entire idea of building these massive fracked gas transmission lines at a time when similar infrastructure has been exploding regularly all over the country shows a blatant lack of regard for the safety and well-being of Virginians.

Explosion and other incident potential seems relevant to air quality in the area...allow me to explain. Recently I watched a video of a meeting between members of the Union Hill community and representatives from Dominion where it was clear to me that Dominion had no emergency plan to deal with fires, explosions, etc at their compressor station. Does anyone know what sort of chemicals might be put into the air should such an incident occur?

I am very concerned for the health and safety of the residents of Buckingham County and ask that you deny this permit for that reason.

Additionally, I am alarmed at Virginias lack of response to climate change. The Commonwealth should be aggressively transitioning to renewable energy, not building high-capacity transmission lines for fracked gas that will contribute to anthropogenic climate change. Virginia seems to be starting to regulate carbon dioxide emissions from electric plants, but so far we seem to be ignoring leaks in natural gas transmission systems. This happens at a critical time as the Administration and EPA seem to be looking to deregulate methane emissions. It occurs to me that if we were actually trying to warm the planet as quickly as possible, it might not look much different from the current deregulatory agenda. Virginia has the ability to regulate the energy industry within our borders, and must do so to bring greenhouse gas emissions down as much as possible.

It is extremely important to me that the Air Pollution Control Board defend Union Hill, Buckingham County, and a livable climate for all Virginians. Please deny the permit for the Buckingham compressor station.

Thank you,
-Chris Tandy
[43607 McDowell Sq.](#)
[Leesburg VA 20176](#)
[703.407.8142](#)

Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham County Compressor Air Permit Letter

1 message

Vernon Tillage <vtillage2@gmail.com>

Fri, Sep 21, 2018 at 1:10 PM

To: airdivision1@deq.virginia.gov, felix.sarfo-kantanka@dominionenergy.com

Good Morning,

Attached to this email is a letter from Senator L. Louise Lucas in regards to the Buckingham County Compressor Station Air Permit. If you have nay questions, please feel free to contact our office at (757) 397-8209 or at district18@senate.virginia.gov.

Thank you



Senator Lucas Letter to DEQ 9-21-18.docx

148K

SENATE OF VIRGINIA

L. LOUISE LUCAS
18TH SENATORIAL DISTRICT
ALL OF GREENSVILLE AND SUSSEX COUNTIES;
ALL OF THE CITY OF EMPORIA; PART OF
BRUNSWICK, ISLE OF WIGHT, SOUTHAMPTON,
AND SURRY COUNTIES; AND PART OF THE CITIES
OF CHESAPEAKE, FRANKLIN,
PORTSMOUTH, AND SUFFOLK
POST OFFICE BOX 700
PORTSMOUTH, VIRGINIA 23705-0700



COMMITTEE ASSIGNMENTS:
COMMERCE AND LABOR
COURTS OF JUSTICE
EDUCATION AND HEALTH
FINANCE

September 21, 2018

Virginia Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060

RE: Buckingham Compressor Station

Dear Department of Environmental Quality:

On behalf of my constituents in the areas of the Atlantic Coast Pipeline that will be impacted by the positive economic development benefits, I appreciate this opportunity to submit our comments on the draft air quality permit for the Buckingham Compressor Station. As you know, the station is an integral part of the Atlantic Coast Pipeline, and along with many other members of the Commonwealth's business community, have strongly supported the project. We believe our state's continued economic health and growth depends upon a secure, reliable and affordable supply of energy. The pipeline is a key to achieving that goal.

However, my constituents could not support the project, no matter how attractive it might be from an energy standpoint, if we felt it had the potential to damage Virginia's environment. Fortunately, we have no such concerns. We are impressed by the developers' commitment to protecting our natural resources. We are equally impressed with the thoroughness and dedication your department has brought to reviewing the ACP's environmental impacts and your willingness to take strong steps to ensure those impacts are held to an absolute minimum. You have shown that same dedication in developing the draft air permit.

We are very pleased with the strict emissions limits included in the draft. Although the station is classified under federal and state regulations as a "minor" source of emissions, we are told that the limits included in the draft permit are much more typical of those imposed on larger facilities with much higher emissions levels. In fact, we understand that the limits in the draft Buckingham permit are four to 10 times stricter than the limits in any other permit recently issued for compressor stations in Virginia. These stringent limits apply to regulated emissions ranging from nitrogen oxides to volatile organic compounds to carbon monoxide, and they will

help ensure that Virginia's air remains clean and healthy even as we expand our energy infrastructure.

Additionally, we are impressed by the control technology required by the draft permit. Here again, these controls are more typical of those mandated for much larger facilities with higher levels of emissions. The systems included in the draft permit cover an impressive range from selective catalytic reduction to as vent gas recovery system designed to minimize the release of natural gas into the atmosphere. We are confident that the developers will carry out the permit's strong requirements for air quality protection.

The Department of Environmental Quality has worked hard for many years to ensure that future generations of Virginians will have clean water and air. We applaud you for continuing that work through the terms and conditions in the draft Buckingham air permit. Thank you again for the opportunity to offer our comments on this important regulatory matter.

Sincerely,

A handwritten signature in dark ink, reading "L. Louise Lucas". The signature is written in a cursive, flowing style with a large initial "L" and a long, sweeping underline.

L. Louise Lucas

cc: The Honorable Ralph S. Northam

Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham County Compressor Station Air Permit Letter

1 message

senate district18 <district18@senate.virginia.gov>

Fri, Sep 21, 2018 at 11:03 AM

To: airdivision1@deq.virginia.gov

Good Morning,

Attached to this email is a letter from Senator L. Louise Lucas in regards to the Buckingham County Compressor Station Air Permit. If you have any questions, please feel free to contact our office at (757) 397-8209 or at district18@senate.virginia.gov.

Thank you

V. Lamont Tillage, Jr.
Legislative Assistant
Senator L. Louise Lucas
District Office 757-397-8209
Richmond Office 804-698-7518



Senator Lucas Letter to DEQ 9-21-18.docx

148K

SENATE OF VIRGINIA

L. LOUISE LUCAS
18TH SENATORIAL DISTRICT
ALL OF GREENSVILLE AND SUSSEX COUNTIES;
ALL OF THE CITY OF EMPORIA; PART OF
BRUNSWICK, ISLE OF WIGHT, SOUTHAMPTON,
AND SURRY COUNTIES; AND PART OF THE CITIES
OF CHESAPEAKE, FRANKLIN,
PORTSMOUTH, AND SUFFOLK
POST OFFICE BOX 700
PORTSMOUTH, VIRGINIA 23705-0700



COMMITTEE ASSIGNMENTS:
COMMERCE AND LABOR
COURTS OF JUSTICE
EDUCATION AND HEALTH
FINANCE

September 21, 2018

Virginia Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060

RE: Buckingham Compressor Station

Dear Department of Environmental Quality:

On behalf of my constituents in the areas of the Atlantic Coast Pipeline that will be impacted by the positive economic development benefits, I appreciate this opportunity to submit our comments on the draft air quality permit for the Buckingham Compressor Station. As you know, the station is an integral part of the Atlantic Coast Pipeline, and along with many other members of the Commonwealth's business community, have strongly supported the project. We believe our state's continued economic health and growth depends upon a secure, reliable and affordable supply of energy. The pipeline is a key to achieving that goal.

However, my constituents could not support the project, no matter how attractive it might be from an energy standpoint, if we felt it had the potential to damage Virginia's environment. Fortunately, we have no such concerns. We are impressed by the developers' commitment to protecting our natural resources. We are equally impressed with the thoroughness and dedication your department has brought to reviewing the ACP's environmental impacts and your willingness to take strong steps to ensure those impacts are held to an absolute minimum. You have shown that same dedication in developing the draft air permit.

We are very pleased with the strict emissions limits included in the draft. Although the station is classified under federal and state regulations as a "minor" source of emissions, we are told that the limits included in the draft permit are much more typical of those imposed on larger facilities with much higher emissions levels. In fact, we understand that the limits in the draft Buckingham permit are four to 10 times stricter than the limits in any other permit recently issued for compressor stations in Virginia. These stringent limits apply to regulated emissions ranging from nitrogen oxides to volatile organic compounds to carbon monoxide, and they will

help ensure that Virginia's air remains clean and healthy even as we expand our energy infrastructure.

Additionally, we are impressed by the control technology required by the draft permit. Here again, these controls are more typical of those mandated for much larger facilities with higher levels of emissions. The systems included in the draft permit cover an impressive range from selective catalytic reduction to as vent gas recovery system designed to minimize the release of natural gas into the atmosphere. We are confident that the developers will carry out the permit's strong requirements for air quality protection.

The Department of Environmental Quality has worked hard for many years to ensure that future generations of Virginians will have clean water and air. We applaud you for continuing that work through the terms and conditions in the draft Buckingham air permit. Thank you again for the opportunity to offer our comments on this important regulatory matter.

Sincerely,

A handwritten signature in cursive script that reads "L. Louise Lucas". The signature is written in dark ink and is positioned below the word "Sincerely,".

L. Louise Lucas

cc: The Honorable Ralph S. Northam

**Deny the Buckingham Compressor Station air permit**

1 message

Mary Trujillo <shakinghandswithgod@gmail.com>

Fri, Sep 21, 2018 at 8:41 PM

Reply-To: shakinghandswithgod@gmail.com

To: airdivision1@deq.virginia.gov

Director of Publ

State Air Pollution Control Board
c/o Ann Regn, Director of Public Information and Outreach
Virginia Department of Environmental Quality
Phone: 804-698-4442
Email: airdivision1@deq.virginia.gov
Fax: 804-527-5106

Dear Director Paylor and members of the Air Pollution Control Board,

I respectfully urge you to deny the draft minor source air permit for the Atlantic Coast Pipeline's Buckingham Compressor Station.

This compressor station poses a direct threat to our climate, our air quality, and - most importantly - to the lives of the historic freedman and largely African American Union Hill community. If built, the compressor station would emit methane, nitrogen oxides, volatile organic compounds and particulate matter into the air in close range to community members' homes and would be a stark example of environmental racism at play in the Commonwealth.

We ask that you deny this permit and request that the following concerns be addressed:

- DEQ and the Air Board must ensure that the permit for the Buckingham Compressor Station does not disproportionately impact marginalized communities. However, the vast majority of residents in close proximity to the proposed compressor station site - 85% - are people of color, and a large proportion are elderly or very young. Therefore, a disproportionate impact on an environmental justice community is virtually guaranteed. If the project cannot be modified to avoid this outcome, the air permit should be denied.
- ACP has not shown that the amount of toxic air emissions from the compressor will not cause or contribute to the endangerment of human health. DEQ should conduct a baseline Health Impact Assessment to better understand what ailments already exist in the community that could be exacerbated by these emissions. The elderly, very young, and community members who already have respiratory health issues are particularly at risk.
- DEQ should require ACP to continuously monitor nitrogen oxide emissions to ensure ACP is complying with the nitrogen oxide emissions limits at all operating periods. The currently proposed stack testing is not sufficient to ensure compliance with the draft permit conditions.
- DEQ should conduct further analysis of the greenhouse gas emissions associated with this proposed compressor station. While Virginia is poised to begin regulating carbon dioxide emissions from electric power plants, ignoring the greenhouse gas emissions from the infrastructure used to supply those power plants is self-defeating. With each new pipeline and compressor station built, significant amounts of methane are emitted into the atmosphere, exacerbating climate change impacts. Though methane does not last in the atmosphere nearly as long as carbon dioxide, methane is much more efficient at capturing radiation than carbon dioxide and, pound for pound, the comparative impacts of methane to carbon dioxide are 25 times greater over a 100 year period. Greenhouse gas emissions are mentioned in the draft air permit, but further analysis of impacts and plans to mitigate those emissions are necessary.
- ACP has not adequately addressed emergency response plans. Detailed plans should be drafted and shared with the community. These plans should outline evacuation and actions in response to an explosion or other emergency at the Buckingham compressor station. At this time, there is no certainty that residents could be evacuated promptly, and Buckingham County emergency responders do not have the supplies or resources to respond to a significant industrial emergency.

It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station. I urge you to deny the permit.

Sincerely,

Mary Trujillo
716 S Casita St
Anaheim, CA 92805
7142933757



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station - VMA Comments

1 message

Brett Vassey <bvassey@vamanufacturers.com>
To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>

Fri, Sep 21, 2018 at 2:58 PM

Please see attached.

Best Wishes,

Brett

Brett A. Vassey
President & CEO
Virginia Manufacturers Association
Virginia Craft Brewers Guild
804.643.7489, ext. 125



2108 W Laburnum Ave

Suite 230
Richmond, VA 23227
804.528.4482
vamanufacturers.com |

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**Virginia Environmental Health
and Safety Conference
(VEHS)**
September 26-27, 2018
Hilton Hotel & Spa

**Virginia Competitiveness Forum
&**

Workforce Symposium
November 13-14, 2018

Richmond, VA

Kingsmill Resort
Williamsburg, VA

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2 attachments**image002.png**
4K**BuckinghamCompressorStationVMAComments.pdf**
120K



2108 W. Laburnum Ave., Suite 230, Richmond, VA 23227

September 21, 2018

Virginia Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060
airdivision1@deq.virginia.gov

RE: Buckingham Compressor Station

Dear Virginia Department of Environmental Quality (DEQ):

On behalf of the Virginia Manufacturers Association (VMA), thank you for the opportunity to submit comments on the draft air quality permit for the Buckingham Compressor Station. This station is an integral part of the Atlantic Coast Pipeline (ACP). We think the Commonwealth's economic competitiveness and growth depends upon a secure, reliable and affordable supply of energy. The ACP is essential to achieving that goal.

The VMA is also committed to responsible environmental management. It is clear that DEQ has thoroughly reviewed the ACP's environmental impacts and is working to minimize them. The strict emissions limits included in this draft air quality permit speak to this point.

Although the station is classified under federal and state regulations as a "minor" source of emissions, we are told that the limits included in the draft permit are typical of those imposed on larger facilities with higher emissions levels. We also understand that the limits in the draft Buckingham permit are significantly more restrictive than other permits (for regulated emissions ranging from nitrogen oxides to volatile organic compounds to carbon monoxide) recently issued for compressor stations in VA. Additionally, we understand that the control technology required by the draft permit is more typical of those mandated for much larger facilities with higher levels of emissions. The systems included in the draft permit cover an impressive range from selective catalytic reduction to a vent gas recovery system designed to minimize the release of natural gas into the atmosphere. It is our expectation that the developers will carry out the permit's strong requirements for air quality protection.

The DEQ's work assures that future generations of Virginians will have clean water and air. Thank you for continuing that work through the terms and conditions in the draft Buckingham air permit.

Sincerely,

Brett A. Vassey

Brett A. Vassey
President & CEO



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

David Walter <David.Walter.107718240@p2a.co>

Fri, Sep 21, 2018 at 8:09 PM

Reply-To: dpwalter457@yahoo.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a "minor" source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to "minor" sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
David Walter
[10224 Waterford Dr](#)
[Manassas, VA 20110](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station,

1 message

Watkins-White, Shepelle <SHWATKIN@southernco.com>

Fri, Sep 21, 2018 at 3:03 PM

To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>

Good afternoon. Please find attached Virginia Natural Gas' comments submitted in support of an application for the Buckingham Compressor Station. I appreciate your attention to the same. Should you need to reach me with any questions, my contact information is below.

Shepelle Watkins-White

Director, Government and Community Affairs

757.616.7536 office

757.374.9833 mobile

shwatkin@southernco.com**Buckingham Compressor St_001.pdf**

85K

September 21, 2018

David K. Paylor
Director
Virginia Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060

RE: Buckingham Compressor Station
 PERMIT NAME: Minor Source Construction Permit issued under the authority of the Air Pollution Control Board
 APPLICANT NAME AND REGISTRATION NUMBER: Atlantic Coast Pipeline, LLC; 21599
 FACILITY NAME AND ADDRESS: ACP – Dominion Energy Buckingham Compressor Station; 5297 S. James River Hwy, Virginia, VA 24599

Dear Mr. Paylor:

Virginia Natural Gas (“VNG”) is a utility serving about 1 million Virginians or approximately 299,000 gas meters from Hanover east to Virginia Beach. VNG has subscribed to service from the Atlantic Coast Pipeline (“ACP”). The Buckingham Compressor Station is an integral part of the ACP and VNG strongly supports the project.

As a public service corporation chartered in 1850 by the General Assembly, and one of the oldest corporations in existence in Virginia today, VNG provides an essential service to an area of Virginia where economic and essential human need has increased the need for additional natural gas infrastructure. VNG safely operates over 5,600 miles of pipeline each day in Virginia. The upstream natural gas system serving Hampton Roads has reached its capacity. The region is directly served by two interstate natural gas transmission pipelines – both of which are many decades old and fully subscribed, with no opportunity for low-cost expansions. This region needs an additional upstream feed into the Virginia Natural Gas service area to supply any new major industrial customers. Further compounding this problem is Hampton Roads’ geographic location: With the Atlantic Ocean to the east, this region is literally and figuratively at the end of the energy line.

As natural gas becomes the fuel of choice for American consumers, the ACP is needed to address a critical lack of interstate pipeline capacity in West Virginia, Virginia and North Carolina. Businesses and residents alike desire natural gas because it is American, abundant, affordable and environmentally friendly. In connection with the ACP, the Buckingham Compressor Station will connect to four existing

Virginia Department of Environmental Quality

Attn: Mr. Paylor

Page 2

September 21, 2018

Williams-Transco pipelines, allowing bi-directional flow to allow delivery to and receipt from Transco. This bi-directional flow will allow for the purchase of gas at the cheapest cost from either Transco or ACP, a win for all consumers of natural gas.

The Buckingham Compressor Station will be equipped with safety systems and environmental controls that will comply with all federal, state, and local regulations and requirements. Based upon the application materials, the developers have made a bold commitment to protecting our natural resources and, likewise, your Department is dedicated to this commitment as reflected in the draft air permit requirements. These requirements include strict emissions limits, selective catalytic reduction, and a vent gas recovery system designed to minimize the release of natural gas into the atmosphere.

The Department of Environmental Quality had diligently worked to ensure Virginians have clean water and air. We applaud you for continuing that work through the terms and conditions of the draft Buckingham air permit. I appreciate the opportunity to offer comments on this very critical matter.

Sincerely,

A handwritten signature in black ink, appearing to read "Jim Kibler". The signature is fluid and cursive, with the first name "Jim" being more prominent than the last name "Kibler".

Jim Kibler

President

Virginia Natural Gas



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

William Weiss <William.Weiss.38100224@p2a.co>

Fri, Sep 21, 2018 at 5:52 PM

Reply-To: billweiss3576@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to “minor” sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
William Weiss
[1788 Clearbrook Ln](#)
[Virginia Beach, VA 23464](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

CEA & VA Resident comment re Buckingham compressor station

1 message

Lauren Westcott <lwestcott@hbwresources.com>

Fri, Sep 21, 2018 at 4:26 PM

To: "airdivision1@deq.virginia.gov" <airdivision1@deq.virginia.gov>

Hello,

On behalf of CEA, where we advocate for energy consumers and provide them with sound, unbiased information on issues around energy policy, and as a Virginia resident, I thank you for the opportunity to submit our comments regarding the Buckingham Compressor Station. This pipeline will help the state of Virginia meet its growing energy needs and improve our economy, both of which are important to me as a resident of this state. Advancing this project is an integral part of the Atlantic Coast Pipeline and has my full support.

Energy is something that impacts every person in America, touching every part of our daily lives. Living in Virginia, I see the truth in this every day. Whether it's on my daily commute, driving out to Shenandoah national park to explore with my dogs, or grilling out on my apartment rooftop, energy impacts me personally at every moment of every day.

Virginia's economic growth depends upon a secure, reliable and affordable supply of energy, which is what this pipeline will provide. The ACP will create over 17,000 new jobs and \$2.7 billion in economic activity across the region. This means a boost business for restaurants, hotels, equipment suppliers, and more. The construction is only the beginning. Once operational, this pipeline will help me save money when it comes to my energy bill. As a young adult living paycheck to paycheck, one of my costliest bills is my electricity bill. That's not including gas for my car and other energy expenses. After researching this project, I discovered that this pipeline will save Virginian households and families an estimated \$377 million dollars a year on energy costs, keeping energy bills low for people like myself.

An additional issue of importance to me is environmental sustainability. Environmental sustainability and reliable, affordable energy infrastructure are not mutually exclusive objectives. In fact, this pipeline will reduce harmful emissions and help Virginia reduce its carbon footprint, helping us play our part in restoring of our beautiful landscapes and wildlife.

Thank you for taking my comments into consideration. This compressor station will be another monumental step towards providing my state with reliable and affordable energy. I speak on behalf of Virginian residents when I say this project will have cost-saving, economic, and environmental benefits for us. Thank you again for the opportunity to offer comments on this important matter.

Sincerely,

Lauren Westcott



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Gary White <Gary.White.125147037@p2a.co>

Fri, Sep 21, 2018 at 4:25 PM

Reply-To: gwhite@wvva.net

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a "minor" source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

The station and its operations are designed to drastically minimize emissions, making it safe for our community. Modeling has demonstrated that any emissions will be well below federal and state standards designed to protect human health. Even though these standards are not typically applied to "minor" sources of emissions like the compressor station, they will be met—and surpassed—by the Buckingham facility.

Thanks to the exhaustive review, the Atlantic Coast Pipeline is a safe, environmentally responsible pipeline project. And Virginia greatly needs the affordable natural gas it will bring to our region. Please do not stand in the way of the huge economic benefit it could have for our communities.

Regards,
Gary White
[906 State Line Rd](#)
[Narrows, VA 24124](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station Permit Comments

1 message

Lee Williams <im4peas@gmail.com>

Fri, Sep 21, 2018 at 3:36 PM

To: airdivision1@deq.virginia.gov

Cc: michael.dowd@deq.virginia.gov, Patrick Corbett <patrick.corbett@deq.virginia.gov>

Dear Sir or Madam,

I'm writing to urge the Air Board and the DEQ to deny the air pollution permit for the Atlantic Coast Pipeline compressor station being proposed in Buckingham County.

The effects of climate change are inextricably entwined with health. New data from the World Health Organization show that 9 out of 10 people breathe air containing high levels of pollutants. Updated estimations reveal an alarming death toll of 7 million people every year caused by breathing polluted air, indoors and out. You have the power to protect vulnerable Virginians.

I respectfully request that the Department of Environmental Quality complete a Quantified Risk Assessment for the Buckingham Compressor Station prior to permitting, and to work with other state agencies to conduct a Health Risk Assessment and a Health Impact Assessment which would address cumulative exposure to toxins in the air from all sources - such as the Transco line and the new mega landfill in Cumberland County.

I question if pre-existing conditions are being taken into account at Union Hill and Buckingham County? Have you quantified disease processes including diabetes, asthma and other lung conditions, such as chronic bronchitis and pneumonia? How about the incidence of heart conditions? Breast and other cancers, COPD, lupus, kidney disease, epilepsy, multiple sclerosis, brain tumor, migraines and more. Where are the studies to assure that the existing Transco pipeline is not contributing to these medical conditions? The 2016 Gasping for Breath report, found that ozone smog from natural gas industry pollution is associated with increased asthma attacks and asthma related emergency room visits and hospital admissions. How far away is the nearest emergency room to residents of Union Hill?

Air pollution does not recognize borders. Improving air quality demands sustained and coordinated government action at all levels. Countries, States, Cities and Counties need to work together on solutions for a sustainable planet by developing more efficient and renewable energy production, not continue to build and strand assets in polluting fossil fuels. It is extremely important that the Air Pollution Control Board defend Union Hill, Buckingham County, and all Virginians' air and climate from the harmful impacts associated with this compressor station.

It is apparent concerns raised by the residents of Union Hill over the past 4 years have not been given full consideration in this process. DEQ must consider environmental justice in all permitting decisions. The life-threatening burdens Dominion is proposing to place on Union Hill residents are the result of unchecked systemic oppression perpetuated by the fossil fuel industry, which exposes communities to health, economic, and social hazards. The nature of the vulnerability of African American and other person of color fence-line communities is intersectional--subject to connected systems of discrimination based on social categorizations such as race, gender, and class.

Thank you for your consideration. I hope you will deny the Atlantic Coast Pipeline compressor station.

Sincerely,

Lee Williams
RVA Interfaith Climate Justice League
804-874-1965



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Larry Wilson <Larry.Wilson.109356178@p2a.co>

Fri, Sep 21, 2018 at 5:20 PM

Reply-To: moemedic1961@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Larry Wilson
[768 Ripplebrook Dr](#)
[Culpeper, VA 22701](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Keith Windle <Keith.Windle.109127703@p2a.co>

Fri, Sep 21, 2018 at 11:08 PM

Reply-To: keith.windle@dominionenergy.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Keith Windle
[16201 Binley Rd](#)
[Midlothian, VA 23112](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Timothy wiseman <Timothy.wiseman.108030567@p2a.co>

Fri, Sep 21, 2018 at 10:45 PM

Reply-To: tim.wiseman@dominionenergy.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Timothy wiseman
[11906 Brook Point Pl](#)
[Chesterfield, VA 23838](#)



Air Division 1, rr <airdivision1@deq.virginia.gov>

Buckingham Compressor Station, Registration No. 215991 message

Kate Wofford <kwofford@svnva.org>
To: airdivision1@deq.virginia.gov
Cc: nsorrells@shenandoahalliance.org

Fri, Sep 21, 2018 at 4:45 PM

Please find attached public comment regarding the proposed Buckingham Compressor Station from Augusta County Alliance and Shenandoah Valley Network.

Thank you for your consideration.

Kate Wofford

Kate G. Wofford, Director
Shenandoah Valley Network
PO Box 186
Luray, VA 22835
www.svnva.org
540-244-7809
kwofford@svnva.org



2018_09_21 ACA and SVN comment to Air Board on Buckingham Compressor Station.pdf
418K



AUGUSTA_{co}
ALLIANCE

September 21, 2018

Submitted via email to:

Mr. Michael Dowd
Director of Air Division
c/o Office of Regulatory Affairs
Department of Environmental Quality
P.O. Box 1105
Richmond, Virginia 23218
airdivision1@deq.virginia.gov

Chairman Richard D. Langford and Members of the Air Pollution Control Board
c/o Office of Regulatory Affairs
Department of Environmental Quality
P.O. Box 1105
Richmond, Virginia 23218

RE: Buckingham Compressor Station, Registration No. 21599

Dear Mr. Dowd, Chairman Langford, and Members of the Air Pollution Control Board:

We write to encourage you to deny the draft minor source air permit for the Atlantic Coast Pipeline's proposed Buckingham Compressor Station.

Shenandoah Valley Network (SVN) links and supports local organizations working to maintain healthy and productive rural landscapes and communities, protect and restore natural resources, and strengthen and sustain our region's agricultural economy in six Shenandoah Valley counties. The Augusta County Alliance is dedicated to preserving the county's rural landscape and economy, clean air and water, abundant wildlife habitat and historic resources. Since 2014, our groups have been supporting communities that are deeply concerned about impacts of the Atlantic Coast Pipeline and its 56-mile route through Augusta County. Thank you for considering our comments.

Over the past four years, we have come to understand that there is no need for the massive Atlantic Coast Pipeline. This lack of need should be addressed before considering the merits of the Buckingham Compressor Station. Atlantic is owned by a conglomeration of energy companies, including Dominion Energy. Affiliates of those same companies have contracted for nearly all of the capacity of the ACP, which they plan to use to generate electricity for a monopolized market. But demand for electricity has been flat or declining for the last

decade. The need for more natural gas for power generation in this region is not expected to increase through 2030. The capacity of existing pipeline and storage infrastructure is more than sufficient to meet demand for natural gas.

Notwithstanding the lack of need for this damaging project, the proposed siting of the compression station is highly flawed. DEQ's engineering analysis includes a section on "site suitability." But DEQ has not considered the suitability of placing this industrial source of pollution in the Union Hill community in Buckingham County. The disproportionate risk of harm faced by the predominantly African-American community that lives within a mile of the proposed compressor station has not been considered.

Preservation Virginia listed the Union Hill community as a "Most Endangered Historic Place" in May 2016 and many of the African American members of this community trace their heritage back to the Freedmen who settled this area following emancipation after the Civil War. Many of the landowners in closest proximity to the proposed compressor station are descendants of people enslaved here, where once the number of slaves was twice that of whites.

Union Hill's unbroken history as an agricultural district is threatened by the proposed compressor station. Many Union Hill community members use their land for agricultural purposes and are concerned the pollution from the compressor station will harm or disrupt those activities.

For these reasons, and many others submitted to you during this comment period, we urge you to deny to the draft minor air permit for this unneeded and poorly sited industrial infrastructure.

Thank you for opportunity to provide public comment and for your consideration.

Sincerely yours,



Kate G. Wofford
Executive Director
Shenandoah Valley Network
PO Box 186
Luray, VA 22835
540.244.7809



Nancy Sorrells
Co-Chair
Augusta County Alliance
3419 Cold Springs Road
Greenville, VA 24440
540.292.4170



Air Division 1, rr <airdivision1@deq.virginia.gov>

Opposition to Buckingham Compressor Station

1 message

jeanettewurster@gmail.com <jeanettewurster@gmail.com>
To: airdivision1@deq.virginia.gov

Fri, Sep 21, 2018 at 10:01 AM

I am a Virginia resident opposed to construction of the proposed huge Buckingham Compressor Station in Central Virginia before a complete Quantified Risk Assessment is made of the pollution threatening local residents.

Jeanette Wurster
3440 S. Jefferson St., Apt. 572
Falls Church, VA.22041

Tel: 703 842 3126

Email: jeanettewurster@gmail.com

Sent from my iPad



Air Division 1, rr <airdivision1@deq.virginia.gov>

The ACP: Safe for Buckingham County

1 message

Steven Young <Steven.Young.108992984@p2a.co>

Fri, Sep 21, 2018 at 5:32 PM

Reply-To: steven.e.young60@gmail.com

To: Ann Regn <airdivision1@deq.virginia.gov>

Dear Director Ann Regn,

The Atlantic Coast Pipeline team has shown considerable responsibility in its plans for the Buckingham County Compressor Station. Although state and federal laws and regulations classify the station as a “minor” source of emissions, the ACP team has agreed to limits and control technologies that are typically required for operations with much higher levels of emissions. In fact, the Virginia Department of Environmental Quality draft air quality permit for the facility contains the most stringent emissions limits imposed on any minor or major natural gas compressor stations in the state.

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Regards,
Steven Young
[1850 Plank Rd](#)
[Natural Bridge, VA 24578](#)